PB82-190208

Draft Environmental Impact Statement City of Los Angeles Wastewater Facilities Plan. General Summary

Los Angeles City Dept. of Public Works, CA

Prepared for

Environmental Protection Agency
San Francisco, CA

Sep 77

U.S. Department of Commerce
National Technical Information Service
NTIS

PB82-190208

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

DRAFT

ENVIRONMENTAL IMPACT STATEMENT CITY OF LOS ANGELES WASTEWATER FACILITIES PLAN

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September 1977

General Summary

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The report reviews the Draft Environmental Impact Statement/Environmental Impact Report for the City of Los Angeles Wastewater Treatment Facilities Plan. The EIS/EIR summary and full report present the environmental, economic and social effects of wastewater facility planning decisions which will affect over 3.4 million persons living in the City of Los Angeles and contract cities, and involve capital costs in excess of 300 million dollars over the next five years.

KEYWORDS: *Sludge disposal, *Sludge treatment, *Environmental impact statements-draft.

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DRAFT
ENVIRONMENTAL IMPACT REPORT
AND
ENVIRONMENTAL IMPACT STATEMENT
FOR THE
CITY OF LOS ANGELES
WASTEWATER FACILITIES PLAN

SEPTEMBER 1977

PREPARED BY:

CITY OF LOS ANGELES
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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
100 CALIFORNIA STREET
SAN FRANCISCO, CALIFORNIA 94111

SEP 01 1977

To All Interested Agencies, Public Groups, and Concerned Individuals:

The report reviews

We submit for your review and comment the Draft Environmental Impact Statement/Environmental Impact Report for the City of Los Angeles Wastewater Treatment Facilities Plan. This statement has been prepared in compliance with the National Environmental Policy Act of 1969 (P.L. 91-190), and implementing regulations promulgated by the Council on Environmental Quality and the Environmental Protection Agency. It has also been prepared in compliance with the California Environmental Quality Act and its implementing regulations.

The EIS/EIR summary and full report present the environmental, economic and social effects of wastewater facility planning decisions which will affect over 3.4 million persons living in the City of Los Angeles and contract cities, and involve capital costs in excess of 300 million dollars over the next five years.

The main purpose of this document is to publicize the long range environmental and social effects of wastewater facility alternatives so that citizens and governmental agencies can comment and express their concerns and preferences. Public comments are expected to play a key role in (1) selection of long-range alternatives for the service area, including size and location of collection and treatment facilities, and (2) implementation of measures needed to reduce adverse environmental effects.

The Environmental Protection Agency, Region IX and the City of Los Angeles, Bureau of Engineering will hold hearings on the Draft EIS, approximately 30 days following the distribution of the EIS. The exact place and date will be announced. All interested parties are invited to express their views at the hearings. Persons wishing to make comments may submit them in writing and/or appear at the hearings. Oral statements will be considered, but, for the record, all important testimony should be submitted to:

Environmental Protection Agency, Region IX
Attn: Fred Krieger, W-1
100 California Street
San Francisco CA 94111

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Enough copies of the written material should be provided so that other interested parties at the hearing may receive a copy. Oral statements should summarize extensive written material since it is necessary for all interested parties to be heard. After the public hearings the Draft EIS/EIR will be revised in light of the comments to form the Final EIS/EIR.

If you do not comment at the public hearings, you may send written comments to EPA at the address given above within thirty days following the hearings.

The following documents constitute the EIS:

Mini-Summary
General Summary
Main text (3 volumes)
Addendum 1. Reclamation Options
Addendum 2. Environmental Analysis of Reclamation
Addendum 3. Interim Sludge Processing and Disposal System
Appendices

Copies of these documents can be obtained by written or by telephone requests at the address given above or at:

City of Los Angeles, Bureau of Engineering
City Hall East-Room 650
200 North Main Street
Los Angeles CA 90012 Attn: Fred Hoeptner
(213)485-3089

Additionally the Draft EIS and supplemental information may be reviewed at the above addresses or at the public libraries within the service area of the City of Los Angeles.

Please bring this notice to the attention of all persons who would be interested in this matter.

Sincerely,

Sheila M. Prindiville

for Paul De Falco, Jr.
Regional Administrator

PREPARATION OF THE EIS/EIR

LIST OF PARTICIPANTS

This Draft EIS/EIR was prepared under the auspices of the Environmental Protection Agency, Region IX. EPA staff was supported by the State Water Resources Control Board (SWRCB), the independent consulting firm of Henningson, Durham & Richardson, Inc., and the City of Los Angeles. The following persons participated in the development of this EIS/EIR:

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A. generation of the EIS

The City of Los Angeles has developed a comprehensive 25-year Facilities Plan for modernization and expansion of the City wastewater collection and treatment facilities. The Environmental Impact Statement interrelates the environmental and engineering issues involved in the development of the Facilities Plan and presents the most viable options based on analyses of the potential effects upon the physical, biological and socioeconomic environment of the City of Los Angeles.

A. GENERATION OF THE EIS

1. RELATIONSHIP BETWEEN EIS AND FACILITIES PLAN

The City of Los Angeles is in the process of completing a plan to meet City sewage treatment needs for the next 25 years. This plan, termed a Facilities Plan, is part of the City's continued long-range planning effort designed to improve the quality of the City environment. A range of alternative technical processes, treatment plant locations, and facilities modifications and additions are identified and evaluated in the Facilities Plan. This plan is provided in response to specific federal and state requirements for upgrading the quality of the treated wastewater discharged and for disposing of the waste treatment by-product known as sludge. As part of the plan, the City has also developed a number of facilities modifications or additions designed to satisfy flow and treatment capacity requirements over the next 25-year planning period.

The City of Los Angeles has applied to both federal and state agencies for grants to cover 87.5 percent of the cost of developing the Facilities Plan and constructing the needed treatment facilities. These grants are available from the Environmental Protection Agency Facility Planning and Construction Funds (201 Grant Program) and the State of California Clean Water Grant Program. These grants are administered through the California State Water Resources Control Board.

With the granting and acceptance of these funds come legal responsibilities toward the residents of Los Angeles and surrounding communities to ensure that implementation of the Facilities Plan will result in an environmentally sound approach to the sewage treatment needs of Los Angeles.

The Environmental Impact Statement (EIS) is a federal document that identifies and evaluates the immediate and long-term environmental effects of implementation of different Facilities Plan alternatives. The Environmental Impact Report (EIR) is a California State document that incorporates specific state requirements, including secondary impacts on the environmental evaluation process. The Facilities Plan, the Environmental Impact Statement, and the Environmental Impact Report combine to assist decisionmakers in their goal to provide adequate wastewater treatment with minimum negative effects on the Los Angeles and regional environment.

This joint Environmental Impact Statement and Environmental Impact Report is designed to meet both federal and state guidelines in one document. To avoid duplication of effort and to expedite processing of both

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the combined EIS and EIR, and the Facilities Plan, the California Water Resources Control Board has accepted responsibility for the development of the Facilities Plan and the Environmental Protection Agency has accepted the main responsibility for environmental review. The combined environmental evaluation is prepared and issued by the Environmental Protection Agency to furnish the residents of Los Angeles and decisionmakers within the City, state, and federal governments with an in-depth analysis of the environmental effects associated with the wastewater treatment Facilities Plan engineering alternatives. For simplicity in this document, this joint EIS and EIR meeting both federal and state guidelines is termed an Environmental Impact Statement.

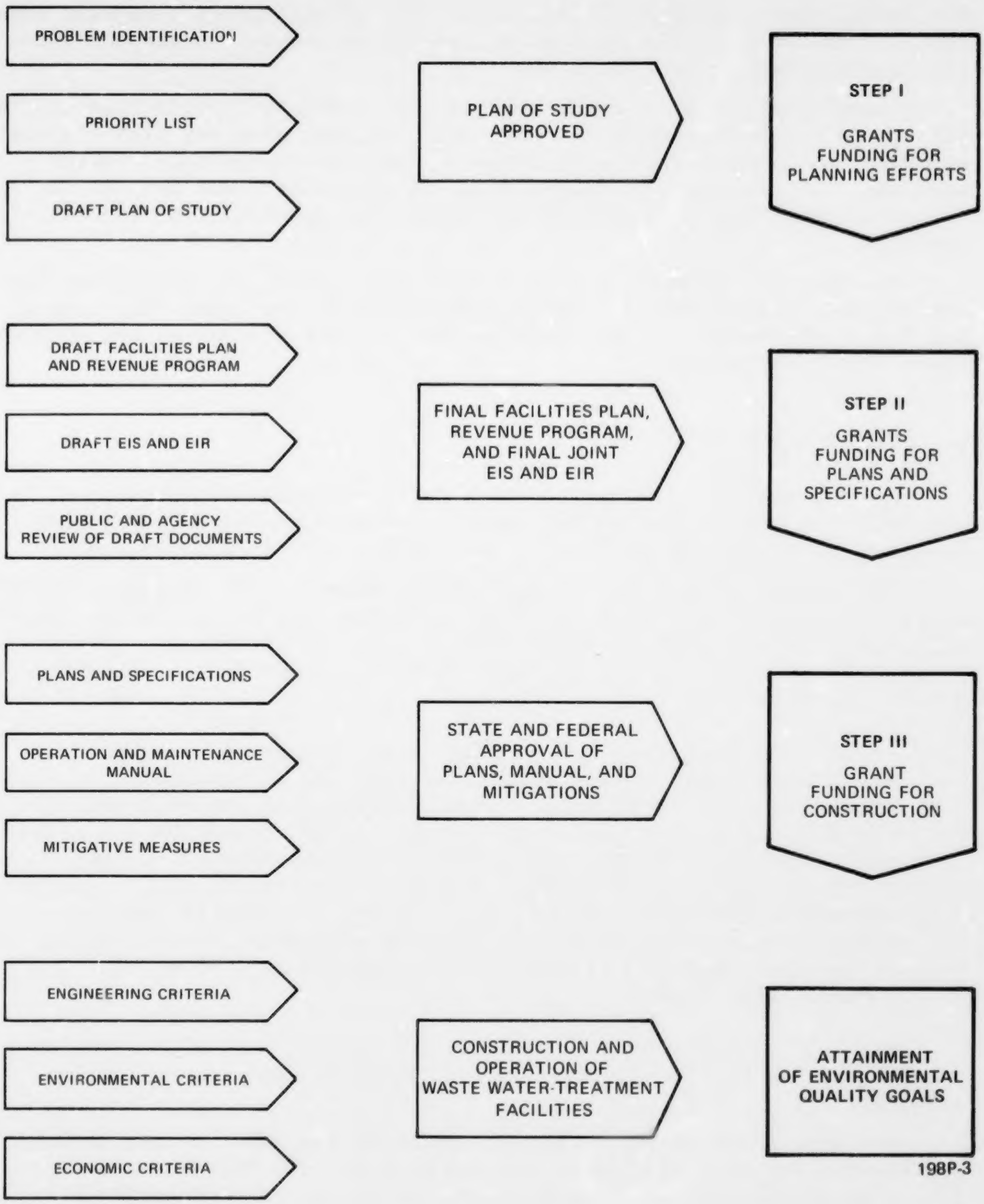
This Draft EIS is designed to clarify the environmental and engineering issues involved in development of the wastewater treatment alternatives and present the most viable options based on analyses of the potentially affected physical, biological, and socioeconomic aspects of the environment within the City of Los Angeles and affected adjacent areas. The Draft EIS will be revised taking into account public and agency comments to form the Final EIS. The Final EIS will present the selected alternatives.

Public input to the EIS process was actively pursued at the commencement of the study effort and will be further incorporated into the Draft EIS. During the months of July and August, 1975, a series of public participation meetings were held to inform the community of the purpose of the Facilities Plan and the EIS. As part of the review process for the Draft EIS, additional public hearings will provide a forum for public interaction to both inform Los Angeles citizens and to receive comment from them. The EIS will be distributed to interested federal, state and local agencies, to local libraries, and to groups and citizens who responded to the newspaper ads for notification cards.

2. DECISIONMAKING STRUCTURE

There are three main steps in the grant-funding process: those leading to the Step 1 Grant for planning, to the Step 2 Grant for engineering design and specifications, and to the Step 3 Grant for construction. Operation and maintenance of the completed facilities are the responsibility of the City of Los Angeles although the guidelines for operation and maintenance are part of the grant process.

Figure GS-1 presents an overview of the decisionmaking and grant-funding process. The three main participants are the city, state and federal governments. The City has responsibility for the actual construction with the State Water Resources Control Board setting guidelines and approving the cost-effective alternative, plant engineering, change orders, and construction bids. Comparably, the City is responsible for implementation of any agreed upon measures to ensure project environmental compatibility and help assure the future quality of the Los Angeles environment. The EPA, through the EIS process, will identify measures to be instituted.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ATTAINMENT OF ENVIRONMENTAL QUALITY GOALS
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Figure GS-1. Decisionmaking and grant-funding process for sewage treatment facilities.

The State Water Resources Control Board (SWRCB) will perform regular assessments to ensure that the steps taken promote an improved environment for the City's residents and visitors.

The ultimate goal of decisionmakers using the Facilities Plan and the EIS is the resolution of Los Angeles water quality problems with minimum economic costs and maximum environmental benefits to the City and its environs. Public input to this process is essential since many of the decisions must take into account the intangible factors of environmental quality.

The City has received a Step 1 Grant under which the Facilities Plan and EIS have been prepared. After publication of the Final EIS, Step 2 and Step 3 of Grants will be given to the City for the design and construction of the facilities.

3. LEGISLATIVE MANDATES

The EIS process resolves around federal and state legislation of 1972 and 1970, respectively. Similar City positions also identify the need for adequate water quality for the citizens of the City of Los Angeles.

The Charter of the City of Los Angeles empowers the City Council to provide wastewater treatment in order to promote the peace, health, safety, and welfare of the public. In accordance with this authority, the City Council set forth its policy on water pollution control in a resolution dated 6 December 1956:

> . . . it is the policy of the City of Los Angeles to provide and maintain facilities for the treatment and disposal of sewage which shall be, at all times, adequate in capacity and adequate for the protection of the public health and the public interests in this and neighboring communities, including the maintenance of the beaches and coastal waters in an attractive condition suitable for recreation and other beneficial uses equal to or better than the conditions specified by the state agencies having control over the subject water (Council File 76940).

The City Council also endorsed the concept of a water reclamation program for the City (Resolution adopted 16 April 1969, Council File 143-207).

The Department of Public Works, headed by the Board of Public Works, administers the water pollution control policy. The Board has jurisdiction over 12 bureaus; of these bureaus, the Bureau of Engineering is responsible for planning and designing public works facilities and the Bureau of Sanitation is in charge of operating and maintaining sewage collection and treatment facilities. Planning by the Bureau of Engineering's Wastewater Systems Engineering Division also involves other City agencies, such as the Departments of City Planning, Recreation and Parks, and Water and Power. The Department of Water and Power is responsible for regulating and controlling the use, sale, and distribution of water in the City.

On 14 December 1972, the City Council adopted a schedule providing for the cessation of the sewage sludge discharge by 31 December 1976. At the same time, the Council adopted a schedule achieving secondary treatment by 1 August 1978. Subsequently, a NPDES permit (CA 0109991) was issued jointly by the EPA and Regional Water Quality Control Board, establishing new compliance dates of 1 April 1987 for the termination of sludge discharge and 1 October 1979 for attainment of full secondary treatment. It does not appear that these dates can be met.

The Federal Act which governs planning for wastewater facilities construction grant monies is Public Law 92-500, the Federal Water Pollution Control Act Amendments of 1972. The objective of PL 92-500 is "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." Two national goals and four policies are established by the Act. The goals are:

1. Elimination of discharges of pollutants into navigable waters by 1985, and
2. Wherever attainable, achievement of water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water by 1 July 1983.

The policies set forth in the Act are:

1. Discharge of toxic pollutants in toxic amounts is prohibited;
2. Federal financial assistance is to be provided for the construction of publicly owned treatment works;
3. Areawide waste treatment management planning processes are to be developed and implemented to assure adequate control of pollutants in each state; and
4. A major research and demonstration effort is to be made to develop the technology necessary to eliminate the discharge of pollutants into "navigable waters, waters of the contiguous zone, and the oceans."

The Federal Water Pollution Control Act Amendments of 1972, which are administered by the Environmental Protection Agency (EPA), identify three levels of planning:

1. Section 201, Facilities Planning. The basic purpose of the Los Angeles Facilities Plan is to demonstrate the need for the facilities, and, by a systematic evaluation of feasible alternatives and a recognition of environmental and social considerations, demonstrate that the proposed measures represent the most cost-effective means of meeting established effluent and water quality goals.

2. Section 303 (3), Basin Plans. The Basin Plan identifies water quality problems of a particular basin and promulgates a program to alleviate these problems. A Facilities Plan (Section 201) is required to be consistent with a Basin Plan.
3. Section 208, Areawide Plans. An area which has substantial water quality control requirements must prepare an Areawide Plan. The areawide planning agency designated for the Los Angeles area is the Southern California Association of Governments (SCAG).

In addition to the National Environmental Policy Act (NEPA), under which the EIS is required, there are other pertinent federal "environmental laws" affecting the Facilities Plan. These include the Clean Air Act of 1967 (PL 90-148), the Clean Air Act Amendments of 1970 (PL 91-604), and the Noise Control Act of 1972 (PL 92-574). PL 91-604 is of particular importance since it requires that no federal action result in degradation of ambient air quality and that every effort be made to improve air quality to the levels measured in the mid-1940s.

Two basic laws applicable to the State of California further specify the actions and programs to be developed in the Facilities Plan: the Federal Water Pollution Control Act Amendments of 1972, and the California State Porter-Cologne Water Quality Act of 1970 (Water Code, Division 7, Section 13000, *et seq*.).

State funding to assist the City of Los Angeles to meet these water standards is provided through the Clean Water Grant Program of the California State Water Resources Control Board (SWRCB). Funds are obtained through the Clean Water Bond Laws of 1970 and 1974 (Water Code, Division 7, Chapters 13 and 14), and are disseminated to supplement federal funds. The contributions by each funding source for Step 1, 2, and 3 grants are:

SOURCE	ADMINISTERED BY	PERCENTAGE
Federal Government	EPA	75.0
State of California	SWRCB	12.5
City of Los Angeles	Public Works	12.5

SWRCB Guidelines require facilities planning according to federal guidelines for implementing Section 201 of PL 92-500 as part of the project approval process:

> The plans must identify the pollution abatement measures necessary to meet applicable state and federal effluent limitations and provide for implementing these measures in accordance with the priorities and schedules developed by the state and regional boards. Consideration must also be given to regional or local water management goals and the additional economic, environmental, and social gains which may be realized through attainment of such goals.

Pursuant to the Porter-Cologne Act, the SWRCB has adopted several directives to be incorporated into the Facilities Plan. The Water Quality Control Plan for Ocean Waters of California (known as the "Ocean Plan"), adopted 6 July 1972, established detailed limits on the concentrations of constituents which may be discharged to ocean waters and established objectives to enhance and maintain this quality. The Water Qualtiy Control Plan Report Los Angeles River Basin (known as the "Basin Plan"), adopted 10 March 1975, establishes beneficial uses for all surface waters in the basin and establishes objectives to protect and enhance these beneficial uses. Finally, the SWRCB adopted the Water Quality Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries in California ("Thermal Plan"), on 18 May 1972. Additionally, on 16 May 1974, the SWRCB adopted the Water Quality Control Policy for Enclosed Bays and Estuaries of California ("Bay and Estuary Policy"), which establishes the policy that discharges of municipal and industrial waters thereto shall be phased out unless they enhance water quality.

The Facilities Plan and the EIS recognize the need for compliance with these city, federal, and state requirements. In each case, the goal of the respective legal mandates is as summarized in the City's policy of 1956: " . . . protection of the public health and the public interests in Los Angeles and neighboring communities."

4. KEY ISSUES

To assist in the focus of the EIS, the Environmental Protection Agency has prepared a statement indicating those issues which are deemed significant relative to environmental effects. In addition, the State Water Quality Control Board has defined certain population estimates and estimated flow rates to ensure that the wastewater treatment capacity will not have detrimental secondary effects upon the communities involved. The City of Los Angeles has identified specific areas of concern for water quality due to hydraulic constraints that could detrimentally affect surface and groundwater in specific areas.

The major environmental issues identified by the Environmental Protection Agency as required for consideration in the EIS are:

- Total System Capacity—What additional capacity should be provided for the system and what are the primary and secondary effects of this capacity?
- Location of System Capacity—Where should the additional capacity be located for cost-effective wastewater treatment with minimal environmental impacts?
- Ocean Discharge—What changes will result in the nature of wastewater constituents entering the Pacific Ocean and what will be the effects of these changes?

- Reclamation—What are the values, feasibility and environmental impacts of measures designed to conserve and utilize wastewater and its components through reclamation?

Full discussion of each of these issues is provided to the extent that data are available or have been obtainable during the period of preparation of the EIS.

a. Total System Capacity. Limited capacity in such utilities as sewage treatment can restrict urban development. If such services are adequate, continued growth may occur and produce a number of secondary impacts on environmental quality, including land use, water quality, and especially air quality. Growth also affects demands for community services such as police and fire protection, energy, transportation, schools, and recreational facilities.

Additional treatment capacity will require a substantial investment of public funds. Before making this commitment, the other services that will be needed and problems caused by growth should be considered.

Any sewage flow reduction caused by water conservation or reduced growth will result in greater unused capacity and lower operational costs of providing service.

The evaluation of indirect effects considers the historical stimulants to growth and population shifts on a regional and local service area basis. This evaluation includes analysis of the role of employment opportunities, transportation facilities, assessed evaluations, supplies of services such as water and sewer, and applicable social factors in determining where, how much, and in what form growth or population shifts are expected to occur over the 25-year period considered in the Facilities Plan. Each of the more viable alternatives developed in the Facilities Plan and presented in Chapter VII is analyzed to determine the indirect impact upon environmentally sensitive areas, especially air quality. Potential measures can be incorporated to mitigate or reduce the severity of the impacts upon the Los Angeles area. Estimated benefits and costs of these mitigative measures are included in Chapter X so that the City and other agencies capable of instituting the measures are aware of the probable net effects of their decisions. A major purpose of the public hearings and comment period is to determine what mitigation measures are acceptable to the public.

b. Location of System Treatment Capacity. The major issue here is whether or not a treatment facility should be constructed in the San Fernando Valley (Sepulveda flood control basin). The proposed Sepulveda facility would treat an initial flow of 40 million gallons per day (mgd) increasing to an eventual ultimate capacity of 90 mgd. If the capacity is not provided at Sepulveda, the capacity would have to be added to the Hyperion facility in Playa del Rey, adjacent to Los Angeles International Airport. Adding the capacity to Hyperion would likely necessitate an additional sewer outfall line (AVORS tunnel) in the San Fernando Valley to transport the wastewater. The issues related to the Sepulveda site include: cost-effectiveness of the separate Sepulveda facility, the possible need for sludge disposal at the facility, its safety during floods and earthquakes, and the impact on groundwater of the discharge. Issues related to an Hyperion location for this capacity include: land availability, the cost of a new outfall line (AVORS tunnel) or problems associated with holding tanks, and usurpation of land areas needed for potential reclamation facilities at Hyperion.

Because provision of either treatment facilities or an outfall line to the San Fernando Valley would allow population density to increase in the Valley at the expense of the City area south of the mountains, of concern to this issue are the secondary impacts, especially those on air quality.

c. Ocean Discharge. The City presently treats all of its wastewater to primary or secondary levels before discharge out a five-mile pipe into Santa Monica Bay. However, Los Angeles also discharges to the ocean the solids removed in the treatment (minus those converted to gases and water). These solids, called "sludge," are discharged out a seven-mile pipe. The EIS attempts to answer the following questions concerning ocean discharge: What adverse impacts presently occuring in the ocean may be reasonably attributed to these wastewater discharges? What concentrations of pollutants still provide for protection of the marine environment? What amount of treatment or wastewater management (e.g., industrial pretreatment) reduces the pollutant concentrations adequately? An additional marine issue which may need resolution is whether a biological oxygen demand (BOD) concentration of higher than 30 mg/l requirement could be tolerated in terms of marine impacts. Many agencies, including the City of Los Angeles, have argued that the standard is too strict for marine discharges.

Presently all domestic wastewater discharges across the nation are mandated by PL 92-500 to achieve as a minimum a secondary level of treatment. As presently defined in EPA regulations, secondary treatment achieves at least a removal to 30 mg/l for both BOD and total suspended solids (TSS). The discharge of any sludge is prohibited, and the City has accepted grant conditions and permits requiring that the discharge terminate. On 14 December 1972, the City Council adopted a schedule to cease the sludge discharge by 30 December 1976. This has been revised by the NPDES permit to 1 April 1978. The City Council asked that EPA further examine the consequences of continued dumping of sludge in the ocean and the impacts of sludge disposal on the land. Originally the sludge removal project had been scheduled to proceed prior to completion of the EIS.

The impacts of the continued discharge of the sludge are described in the description of the existing marine environment in Chapter III. The impacts of disposal on the land are covered in Addendum #3.

Forty percent of the solids removed by wastewater treatment are converted into gases and water. The remaining 60 percent are subsequently discharged to the ocean through the seven-mile outfall. Since most of the removed solids are discharged as sludge, the current wastewater system does not achieve its potential net benefit for marine water quality. The conversion of solids to gases and water likely lessens the potential for the accumulation of a blanket of organic material on the ocean bottom. However, the problem constituents—metals and chlorinated hydrocarbons—are discharged in the same quantities with the present treatment system as would be the case with no treatment. Table GS-1 gives predicted HTP effluent qualities for the five-mile outfall with and without full secondary treatment, and for the seven-mile outfall with sludge discharge. These values can be compared to state and federal limitations shown on the same table.

The significance of the issue is underscored by a conclusion of the University Task Force to Evaluate Water Quality Effects of Hyperion Sludge Discharge (May 1977):

> It is obvious that the environment around the 7-mile line is unhealthy for many, but not all, species, We do not recommend eating fish caught in the vicinity of the Hyperion outfalls, because of the accumulations of halogenated hydrocarbons.

d. Reclamation. The City presently reclaims a small portion of its wastewater at the Los Angeles-Glendale facility. A major issue discussed in the EIS is the potential for large-scale reclamation both at the Hyperion facility and at a proposed La Cienega facility. Of major importance in the Facilities Planning effort is the need to accommodate future reclamation opportunities by appropriate facility siting and by the adoption of treatment techniques which produce effluents amenable to reclamation.

The specific issues involved are as follows:

- How does the secondary treatment process used affect the potential for reclamation? The existing 100 to 150 mgd "coarse bubble" aerated effluent is reasonably amenable to reclamation. "Fine bubble" air aeration is probably equivalent. "Oxygen" aerated effluent is least amenable for reclamation, however, it is also less costly and is therefore the City's preferred treatment option for the entire facility.
- Should progress toward complete secondary treatment for the system be delayed to complete studies of the viability of the proposed La Cienega reclamation plant?

These issues are explored in the main text and in Addenda #1 and #2.

Table GS-1. Characteristics of the HTP 5- and 7-mile effluents in 1975 along with the predicted 5-mile effluent for No Project (A1) and full secondary treatment (B4C, C3, CX, E2) (HTP, 1976; CLA, 1976; Hoeptner, December 23, 1976).

CONSTITUENT	CONCENTRATION (mg/l)				
	5-MILE		7-MILE	5-MILE	OCEAN PLAN STANDARDS TO BE EXCEEDED < 50% OF THE TIME[4]
	1975[1]	PREDICTED[2] NO PROJECT	1975[1]	PREDICTED FULL SECONDARY[3]	
COD	250[5]	198	7,700[5]	70	
BOD	125	96	1,900[5]	15	
TSS	85	65	7,300[5]	25	50
TDS	870[5]	923	954[5]	904	
pH (no units)	7.3	7.1	7.3	6.9	6 to 9
Oil and Grease	20	15.3	970	0.7	10
Phenols	0.04	0.04	0.29	0.02	0.5
Detergents (MBAS)	3.9	4.6	ND	1.27	
Organic Nitrogen	8.5	6.9	344	5.76	
Nitrite Nitrogen	0.07	0.02	ND	0.03	
Nitrate Nitrogen	0.16	0.17	ND	0.14	
Ammonia Nitrogen	13.9	16.4	300[5]	17	40
Silicate	19.1[5]	20	ND	21	
Phosphate Phosphorus	9	18	80	3.39	
Cyanide	0.14	0.2	0.67	0.11	0.1
Aluminum	0.55	0.57	ND	0.46	
Copper	0.19	0.17	16.8	0.11	0.2
Zinc	0.23	0.29	23.1	0.23	0.3
Iron	0.64[5]	0.61	78.7[5]	0.53	
Nickel	0.15	0.17	3.1	0.14	0.1
Lead	0.13	0.04	2.05	0.03	0.1
Arsenic	0.01	0.01	0.29	0.01	0.01
Cadmium	0.02	0.03	1.17	0.02	0.02
Chromium (+6)	0.00[5]	0.00	ND	0.00	0.005[6]
Chromium (+3)	0.13	0.21	11.7	0.14	
Manganese	0.02[5]	0.03	0.19[5]	0.03	
Selenium	0.02	0.03	0.27	0.019	
Mercury	0.002	0.003	0.108	0.02	0.001
Silver	0.02	0.03	0.80	0.019	0.02
Total Identifiable Chlorinated Hydrocarbons	0.00614	0.0018	0.02747	0.002	0.002

[1] Data from HTP (1976) and CLA (1976).

[2] Predicted assuming primary treatment of 214 mgd of 1974 quality + secondary treatment of 200 mgd with quality of last column.

[3] Prediction for UNOX.

[4] These are median values where the outfall concentrations are means. If the outfall values form a normal distribution about the mean, the mean is the same as the median.

[5] 1974 effluent quality.

[6] Total chromium.

e. Other Issues. A number of additional issues are explored in the EIS. This includes:

- *Chlorination*— This refers to the need for disinfection of the effluent before discharge.
- *Replacement of the existing secondary treatment*— In addition to the reclamation impact, this issue revolves around the impact on the marine environment with regards to discontinuing secondary treatment for a period of years while "oxygen" aerated secondary facilities are constructed.
- *Storm period overflows*— Approximately once per year, an overflow occurs from a sewer into a flood control channel and occasionally other lesser overflows also occur. Prevention of these overflows is a legal requirement and a main goal of the Facilities Plan.

199P-6

B. key project design considerations

GS-15

B. KEY PROJECT DESIGN CONSIDERATIONS

1. BRIEF DESCRIPTION OF EXISTING FACILITIES

The Los Angeles wastewater treatment system has developed over a period of nine decades with the City's major emphasis, until recent years, on the establishment of one main coastal plant, Hyperion. Pipe conduits or sewers of various sizes and classifications transmit wastewater from the place where it is generated and deliver it to the coastal plant for treatment. The Hyperion Treatment Plant (Figure GS-2), located on a 144-acre site adjacent to Santa Monica Bay, southwest of the Los Angeles International Airport, receives sewage from four major interceptor sewer systems:

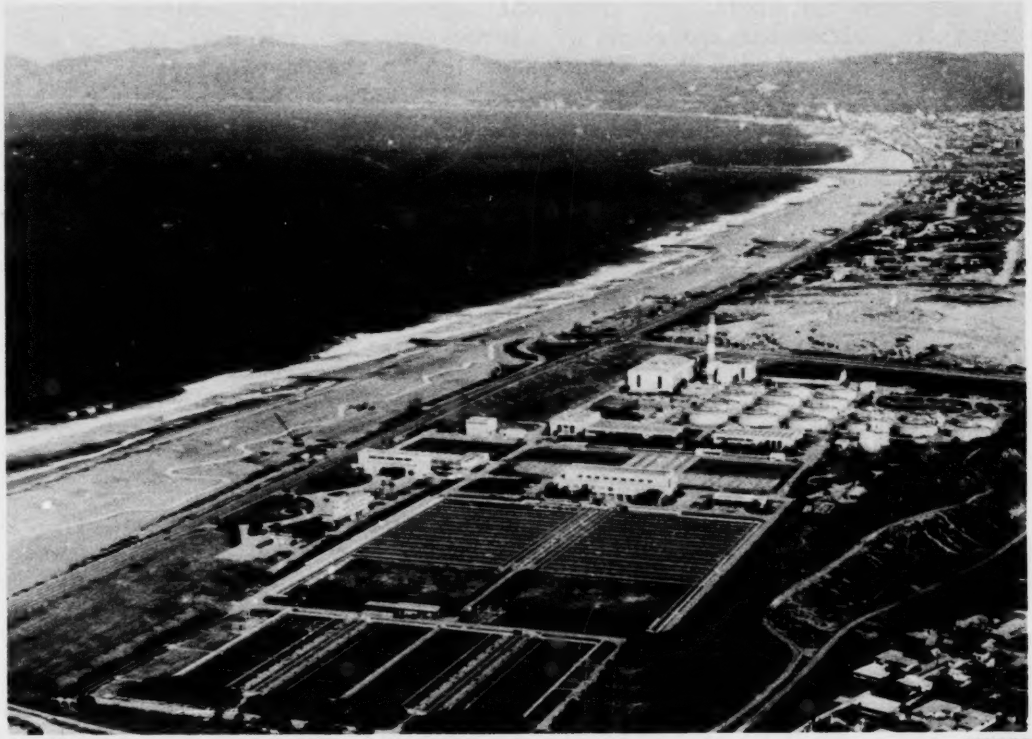
198P-30

Figure GS-2. The Hyperion Treatment Plant is in its ninth decade of service to the City of Los Angeles.

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- CENTRAL OUTFALL SEWER (COS) serving the south central Los Angeles area and adjoining areas to the south and southwest of the downtown area, El Segundo, and portions of Culver City.
- NORTH CENTRAL OUTFALL SEWER-NORTH OUTFALL SEWER INTERCEPTOR SYSTEM (NCOS-NOS) serving the southern portions of the cities of Burbank and Glendale, eastern portions of the San Fernando Valley, sections of eastern, central, and south-central Los Angeles, and portions of Culver City.
- NORTH OUTFALL SEWER-LA CIENEGA, SAN FERNANDO VALLEY RELIEF SEWER INTERCEPTOR SYSTEM (NOS-LCSFVRS) serving the western portions of the City of Los Angeles, Beverly Hills, Hollywood, the central, northeastern, and western areas of the San Fernando Valley, and the Ballona Creek Valley, and Playa del Rey.
- COASTAL INTERCEPTOR SEWER SYSTEM (CIS) serving the coastal area of the City of Los Angeles, Pacific Palisades, Venice, and Mar Vista, the City of Santa Monica, and adjacent areas of the county of Los Angeles.

The need for additional treatment capacity and the potential cost-effective reclamation and reuse of wastewater, combined with the age of portions of the existing NCOS-NOS system led to the development of the Los Angeles-Glendale Water Reclamation Plant (LAGWRP) in the Los Angeles Narrows. This facility, operational in 1976, places treatment nearer the source of sewage and provides reclaimed water for irrigation and industry in an area where such reclaimed water can be economically marketed. The tertiary treated effluent from this inland plant will be used for irrigation, industry, and recreation or discharged to the Los Angeles River. Sludge from LAGWRP is transported to the Hyperion Treatment Plant via the North Central Outfall Sewer-North Outfall Sewer Interceptor System (NCOS-NOS).

The Wilmington and San Pedro areas of the City are served by a separate "coastal" treatment plant located on Terminal Island in the Los Angeles Harbor. The 14-acre Terminal Island Treatment Plant (TITP) treats sewage for an area that is twenty-five miles south of downtown Los Angeles and geographically isolated from the remainder of the City.

A schematic representation of the existing system including both the Hyperion and Terminal Island systems is given in Figure GS-3. The Los Angeles-Glendale plant is the only sewage treatment/water reclamation plant currently within the City's waste treatment system. It will be fully operational in 1977, and is treated in the EIS as an existing facility operating at a capacity of 20 mgd.

Also in the tributary area of the Hyperion Treatment Plant (HTP), but not owned by the City of Los Angeles, is the Burbank Water Reclamation Plant. This plant is owned, and operated at an average rate of 9 mgd, by the City of Burbank. Sludge is conveyed to the City of Los Angeles system and removed at HTP. Reclaimed water is used for cooling in Burbank's adjacent power plant.

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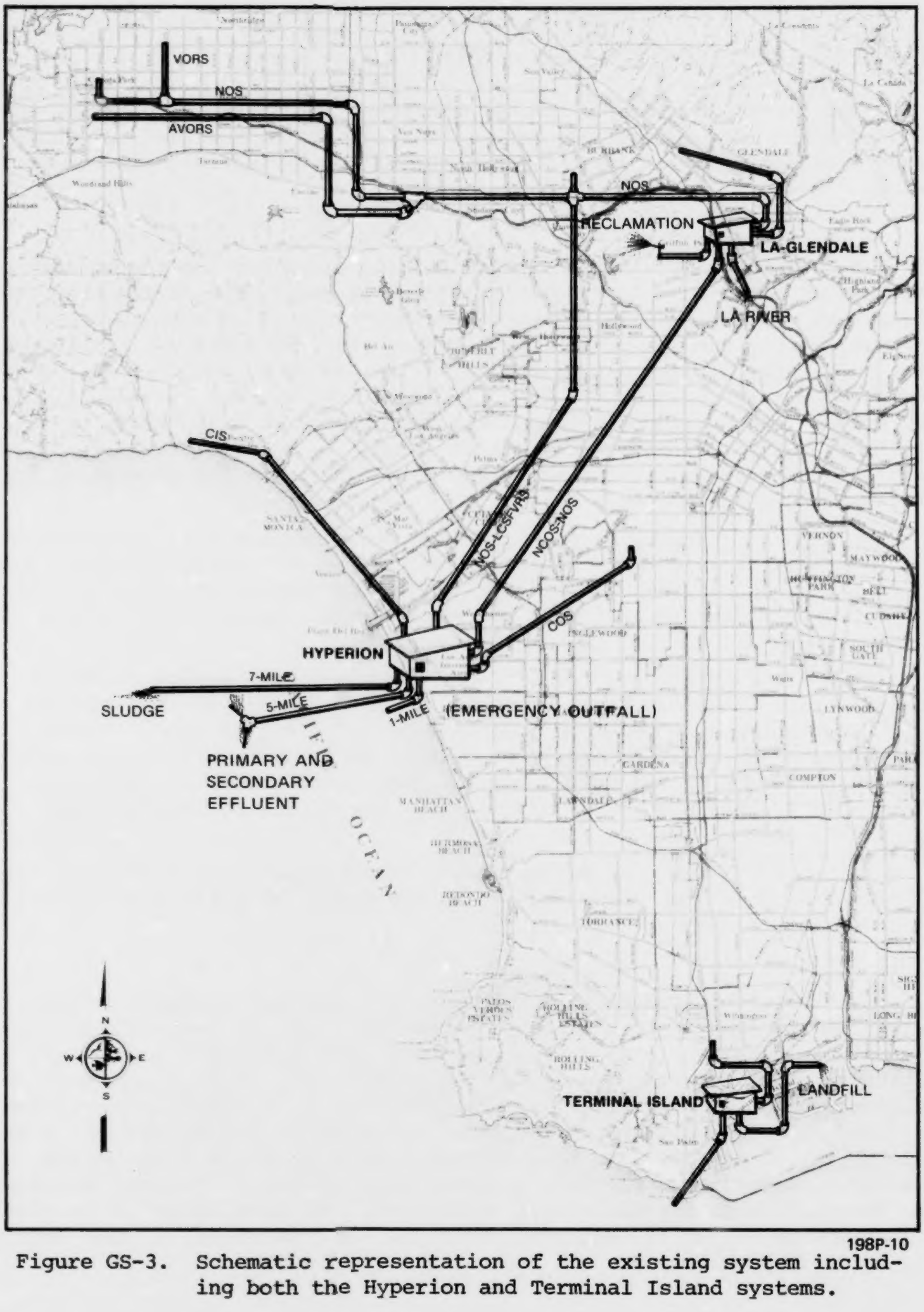
VORS
NOS
AVORS
NOS
RECLAMATION
LA-GLENDALE
LA RIVER
CIS
NOS-LCSFVRS
NCOS-NOS
COS
HYPERION
7-MILE
SLUDGE
5-MILE
1-MILE
(EMERGENCY OUTFALL)
PRIMARY AND
SECONDARY
EFFLUENT
OCEAN
TERMINAL ISLAND
LANDFILL
N
W
E
S
Northridge
Burbank
Glendale
Van Nuys
North Hollywood
Woodland Hills
Tarzana
La Canada
Eagle Rock
Highland Park
Hollywood
Bel Air
Beverly Hills
Westwood
Palms
Santa Monica
Venice
Inglewood
Vernon
Maywood
Huntington Park
Bell
Cudahy
South Gate
Watts
Lynwood
Compton
Gardena
Lawndale
Manhattan Beach
Hermosa Beach
Redondo Beach
Torrance
Palos Verdes Estates
Rolling Hills Estates
Rolling Hills
Wilmington
San Pedro

198P-10

Figure GS-3. Schematic representation of the existing system including both the Hyperion and Terminal Island systems.

2. DEFICIENCIES IN THE PRESENT SYSTEM

The present collection and treatment system for the City of Los Angeles and contract cities requires several improvements to meet federal and state water quality requirements. Each of the main deficiencies is noted on Figure GS-4.

a. Disposal of Sludge. Sludge is a generic term for the concentrated stabilized solids that are separated from the wastewater during the sewage treatment process. Sludge particulates contain most of the toxic heavy metals leaving the sewage treatment plant, and also contain a portion of the nutrients. Almost all of the sludge generated by the City of Los Angeles, nearly 600 tons per day, is pumped into a 7-mile submerged pipe or outfall that transports the sludge to the head of a submarine canyon in Santa Monica Bay and discharges the sludge at a depth of 320 feet. The sludge discharge was initiated in 1957 when a program for converting it to fertilizer was abandoned.

Little is currently known regarding the ingestion and concentrations of heavy metals in animals living or feeding in the vicinity of the sludge outfall. This EIS has gathered and synthesized published information and processed raw data in an effort to estimate the impacts of the City's ocean sludge disposal on the marine ecosystem.

Public Law 92-500 requires that the discharge of sludge to marine waters cease by 1977. Past wastewater facility construction grants to the City contained conditions calling for the cessation of the sludge discharge. The City Council adopted these dates. The dates were extended in the NPDES permit to April 1, 1978. Some interim dates in the permit have not been met and it is very unlikely the City will meet the April 1, 1978 deadline.

A Project Report and Environmental Impact Report for an interim Sludge Disposal Project have been prepared by the City. This project is further discussed in Addendum #3.

b. Level of Treatment. Wastewater flowing into a sewage treatment plant can receive various levels of treatment that are basically grouped into three categories: primary, secondary, and tertiary. Domestic, commercial, and industrial sewage carries a wide range of materials both in suspension and in solution. Primary treatment is designed to remove the settleable solids; secondary treatment decreases suspended solids and the concentration of materials that deplete dissolved oxygen (BOD) in the receiving waters; and tertiary treatment provides still further improvement in the quality of the discharged wastewater. (A large number of tertiary treatment processes is available, with different purposes, so they cannot be categorized simply.)

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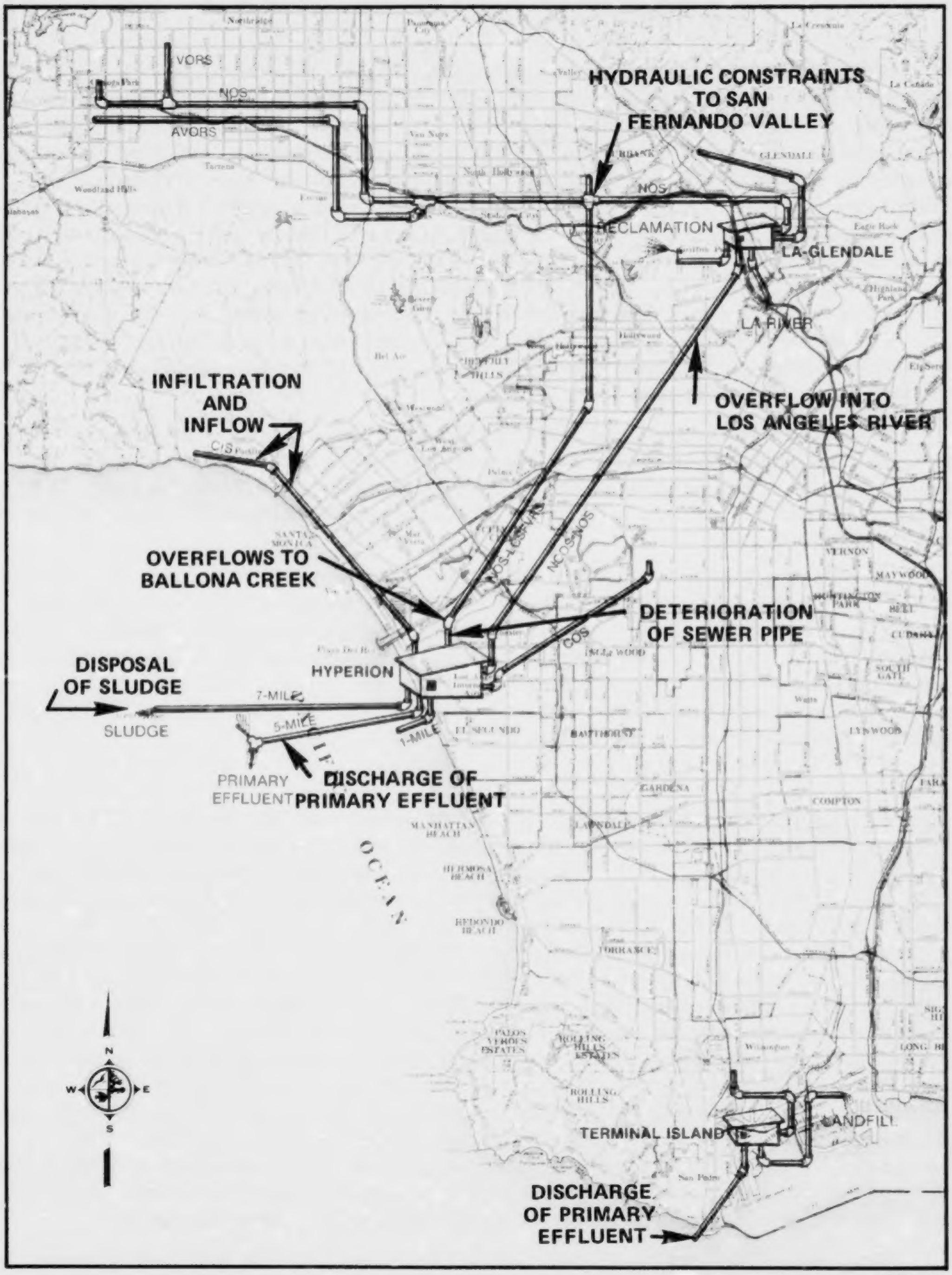
VORS
NOS
AVORS
HYDRAULIC CONSTRAINTS TO SAN FERNANDO VALLEY
NOS
RECLAMATION
LA-GLENDALE
LA RIVER
OVERFLOW INTO LOS ANGELES RIVER
INFILTRATION AND INFLOW
CIS
OVERFLOWS TO BALLONA CREEK
NOS-LOS-VNS
NCOS-NOS
COS
DETERIORATION OF SEWER PIPE
DISPOSAL OF SLUDGE
HYPERION
7-MILE
SLUDGE
5-MILE
1-MILE
PRIMARY EFFLUENT
DISCHARGE OF PRIMARY EFFLUENT
OCEAN
TERMINAL ISLAND
LANDFILL
DISCHARGE OF PRIMARY EFFLUENT
N
S
E
W
Northridge
Van Nuys
North Hollywood
Woodland Hills
Encino
Tarzana
Glendale
Eagle Rock
Highland Park
La Crescenta
La Cañada
Burbank
Hollywood
Bel Air
Beverly Hills
West Los Angeles
Santa Monica
Playa Del Rey
El Segundo
Hawthorne
Inglewood
Vernon
Maywood
Huntington Park
Bell
Cudahy
South Gate
Watts
Lynwood
Compton
Gardena
Lawndale
Manhattan Beach
Hermosa Beach
Redondo Beach
Torrance
Palos Verdes Estates
Rolling Hills Estates
Rolling Hills
Wilmington
San Pedro
Long Beach

198P-11

Figure GS-4. Deficiencies in the present City of Los Angeles Wastewater Treatment System.

At present, all wastewater in Los Angeles (approximately 360 million gallons per day, mgd) receives at least primary treatment. An additional 100 mgd of this also receives secondary treatment at the Hyperion Treatment Plant. There, the secondary treated wastewater is mixed with primary treated wastewater to improve the average quality of the effluent, and discharged to the ocean through the 5-mile outfall pipe. Federal and state mandates require that this wastewater discharge be upgraded to meet at least secondary treatment levels. One of the initial design criteria for the Facilities Plan is the development of methods for secondary treatment of wastewater discharged into the marine environment. In addition, the Facilities Plan proposes methods to improve the quality of effluent discharged into any inland watercourse, such as the Los Angeles River through advanced treatment.

Treatment criteria (both PL 92-500 and the state's "Ocean Plan") will necessitate the construction of new facilities at Hyperion to treat all wastewater to the secondary level prior to ocean discharge through the 5-mile outfall. The space limitations at the Hyperion site require particular attention.

An existing primary treatment plant at Terminal Island is currently being upgraded to provide both full secondary treatment, and increased capacity to process industrial discharges now polluting the Harbor. Advanced treatment of discharges to inland waterways will be provided by the Los Angeles-Glendale inland plant. Any future inland plants, such as the proposed Sepulveda Facility or the potential La Cienega plant, would also require advanced levels of effluent treatment.

c. Capacity Requirements. The projection of wastewater flows to ensure adequate treatment capacity to meet water quality criteria is one of the most demanding tasks to facilities planning. Factors which influence flow projections include birth rate, population in-migration, family size, per capita water consumption, price and availability of water, use of such items as water softeners, and technological innovations in water conservation measures. The Facilities Plan is designed to take the most significant factors contributing to flows into consideration and to project treatment needs in accordance with estimated flows. In addition, in 1956, the City established the position that private sewage disposal units, including septic tanks, be discouraged to preserve both broundwater and surface water quality. At present, there are sections of the City which are developed but unconnected to the Los Angeles Sewer System. The Facilities Plan is designed to incorporate the flows anticipated when septic system failures and potential adverse water quality impacts require the connection of these unsewered areas to public sewer systems.

Two population projections are used to depict how project phasing could be developed under different population scenarios:

- Southern California Association of Governments (SCAG '76).
- The California State Department of Finance (DOF E-O).

The DOF E-O projections are based upon zero net in-migration to the City of Los Angeles as a whole. The SCAG-76 estimate uses a different intrabasin allocation of population than projected by the DOF E-0. Table GS-2 lists estimates for Hyperion tributary flows based on DOF E-0 population projections for the same area. Table GS-3 projects the SCAG-76 flows for the area tributary to Hyperion and estimates the Hyperion residual capacity requirement should no additional plants be constructed. The 18.5 million gallons per day of inland capacity is the Los Angeles-Glendale Water Reclamation Plant which initiated operations in 1976.

The DOF E-O projection is used by the SWRCB as the basis to determine grant eligibility. In critical air basins, funding is limited to the DOF E-O flow equivalent or present flow, whichever is greater, rather than the higher SCAG '76 projections. The SCAG '76 projection is likely the most realistic and therefore is essential for planning purposes. Capacity can be provided at the Sepulveda site in the San Fernando Valley, at the La Cienega site or at the existing Hyperion facility, or a combination of these.

Table GS-2. Hyperion tributary flows in mgd based on DOF E-O, 5-day 5-week projections (Bureau of Engineering, July 1976).

SOURCE OF PROJECTED FLOW	1975	1980	1985	1990	1995	2000
Areas Currently Sewered plus Service to Others	374.1	353.6	346.1	338.7	335.2	331.7
Areas Currently Unsewered	0	7.5	9.5	11.5	14.3	17.1
Infiltration	10.0	10.0	10.0	10.0	10.0	10.0
Total System Flow[1]	384.1	371.1	365.6	360.2	359.5	358.8
Inland Capacity[2]	0	19.0	19.0	19.0	19.0	19.0
Residual Capacity	384.1	352.1	346.6	341.2	340.5	339.8

[1] Does not include Burbank WTP project capacity.

[2] Los Angeles-Glendale Water Reclamation Plant at 20.0 mgd, 1.5 mgd sludge return.

Table GS-3. Hyperion tributary flows in mgd based on SCAG '76, 5-day 5-week projections (Bureau of Engineering, July 1976).

SOURCE OF PROJECTED FLOW	1975	1980	1985	1990	1995	2000
Areas Currently Sewered plus Service to Others	374.1	378.9	389.0	399.0	406.4	413.9
Areas Currently Unsewered	0	7.5	9.5	11.5	14.3	17.1
Infiltration	10.0	10.0	10.0	10.0	10.0	10.0
Total System Flow[1]	384.1	396.4	408.5	420.5	430.7	441.0
Inland Capacity[2]	0	19.0	19.0	19.0	19.0	19.0
Residual Capacity	384.1	377.4	389.5	401.5	413.7	422.0

[1] Does not include Burbank WTP projected capacity.

[2] Los Angeles-Glendale Water Reclamation Plant at 20.0 mgd, 1.5 mgd sludge return.

d. Sewer Overflows. Overflows can occur whenever the sewage flow exceeds the hydraulic capacity of the sewer pipes. This establishes an added requirement on capacity decisions. Not only must the total capacity be estimated, but, in addition, the capacity for specific areas such as the West San Fernando Valley must also be estimated so that facilities are available to meet the sewage flow needs wherever growth is permitted to occur. These overflows and potential overflow problems can be corrected by:

- Providing inland treatment within the area needing hydraulic relief, with discharge of treated water to a natural water course or with irrigation or other similar uses of effluent.
- Providing a main line or interceptor sewer that transmits the sewage to a coastal facility for treatment.
- Preventing further sewage hookups when capacity restrictions are reached.

The City of Los Angeles has historically used all three of these methods to prevent environmental degradation. However, realistically the first two options are most viable. Figure GS-5 shows where sewer overflows into waterways have occurred in the past.

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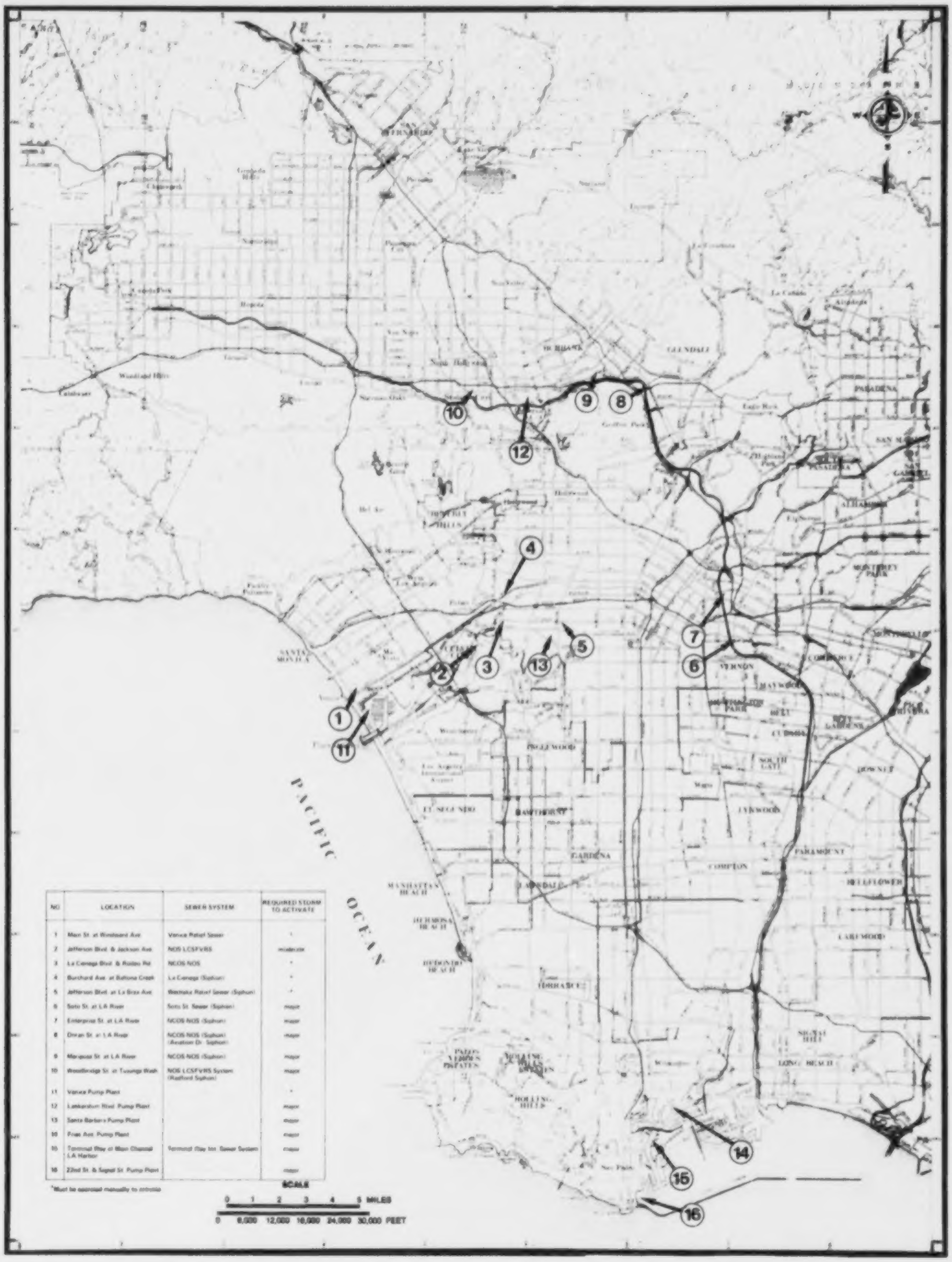

GLENDALE
PASADENA
BURBANK
North Hollywood
BEVERLY HILLS
SANTA MONICA
PACIFIC OCEAN
VERNON
MAYWOOD
BELL
CUDAHY
SOUTH GATE
LYNWOOD
COMPTON
PARAMOUNT
BELLFLOWER
DOWNEY
LAKEWOOD
SIGNAL HILL
LONG BEACH
INGLEWOOD
HAWTHORNE
EL SEGUNDO
GARDENA
MANHATTAN BEACH
HERMOSA BEACH
REDONDO BEACH
TORRANCE
PALOS VERDES ESTATES
ROLLING HILLS
ALHAMBRA
MONTEREY PARK
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
SCALE
0 1 2 3 4 5 MILES
0 6,000 12,000 18,000 24,000 30,000 FEET

NO	LOCATION	SEWER SYSTEM	REQUIRED STORM TO ACTIVATE
1	Main St. at Windward Ave	Venice Relief Sewer	*
2	Jefferson Blvd. & Jackson Ave.	NOS LCSFVRS	moderate
3	La Cienega Blvd. & Rodeo Rd.	NCOS NOS	*
4	Burchard Ave. at Ballona Creek	La Cienega (Siphon)	*
5	Jefferson Blvd. at La Brea Ave.	Westside Relief Sewer (Siphon)	*
6	Soto St. at LA River	Soto St. Sewer (Siphon)	major
7	Enterprise St. at LA River	NCOS NOS (Siphon)	major
8	Doran St. at LA River	NCOS NOS (Siphon) (Avalon Dr. Siphon)	major
9	Mariposa St. at LA River	NCOS NOS (Siphon)	major
10	Woodbridge St. at Tujunga Wash	NOS LCSFVRS System (Radford Siphon)	major
11	Venice Pump Plant		*
12	Lankershim Blvd. Pump Plant		major
13	Santa Barbara Pump Plant		major
14	Fries Ave. Pump Plant		major
15	Terminal Way at Main Channel LA Harbor	Terminal Way Int. Sewer System	major
16	22nd St. & Signal St. Pump Plant		major

*Must be operated manually to activate

198P-416

Figure GS-5. Overflows from sewers to natural water courses and storm drains in the City of Los Angeles.

198P-12

C. brief description of existing environment

The City of Los Angeles is a city of cities that covers approximately 469 square miles and encompasses nearly every type of Southern California physical environment from the seashore to coastal plains, mountains, and inland valleys. Residents can choose from high-rise intensely developed apartments within walking distance of City Hall to single-family medium lot subdivisions in the San Fernando Valley over 23 miles from downtown. A resident from the northwestern end of the City could travel over 55 direct freeway miles east and south through the city center and on to the Los Angeles Harbor and still be within the Los Angeles City limits. Providing wastewater treatment for this complex region is a herculean task that requires over 6,000 miles of sewers with an average daily flow in excess of 360 million gallons of sewage.

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C. BRIEF DESCRIPTION OF EXISTING ENVIRONMENT

1. PHYSICAL CHARACTERISTICS

a. Topography and Hydrology. The physical characteristics of the City and the existing wastewater treatment plant service areas can be seen in Figure GS-6. The coastal plain rises from sea level on the south and west to about 500 feet in the Hollywood Hills. A series of foothills rise rapidly into the Santa Monica Mountains which reach a maximum elevation of 2,126 feet. At the eastern end of the Santa Monica Mountains is the 1,885-acre Griffith Park with a zoo and recreational areas. The Santa Monica Mountains abruptly end at Griffith Park where the Los Angeles River has cut a narrow defile between the Santa Monica Mountains and the Verdugo Mountains to the east. The Los Angeles-Glendale Water Reclamation Plant is located adjacent to the river in the Los Angeles Narrows between the two mountains.

The San Fernando Valley lies between the Santa Monica Mountains and the Verdugo, and is surrounded by the San Gabriel and the Santa Susana Mountains to the east, north, and west. This 23-mile wide east-west valley is drained by the Los Angeles River and is the northern extent of the area that can be served by gravity flow to the Hyperion Sewage Treatment Plant.

Also within the Hyperion Service Area is Ballona Creek which drains the northwestern portion of the Coastal Plain and enters Santa Monica Bay adjacent to the main channel at Marina del Rey. Dominguez Channel is an improved drainage channel which drains the low lying southwest area and discharges into Los Angeles Harbor and then into San Pedro Bay.

The Los Angeles Basin has a groundwater storage capacity rated at approximately 30,000,000 acre-feet. The groundwater quality is very high with total dissolved solids ranging between 200 and 1,000 parts per million (abbreviated milligrams per liter, mg/l). The depth to groundwater varies greatly in both the Los Angeles Basin and the San Fernando Valley with the water table being considerably closer to the surface in the San Fernando Valley where depths range between 5 and 200 feet. This high water table combined with the good quality of current groundwaters serve as an impetus to prevent any activity which could lead to degradation of groundwater quality.

Seawater intrusion is a constant threat in the flat coastal areas. The landward hydraulic gradient within the shallow aquifers in the Terminal Island area, for example, has permitted seawater intrusion to a point almost

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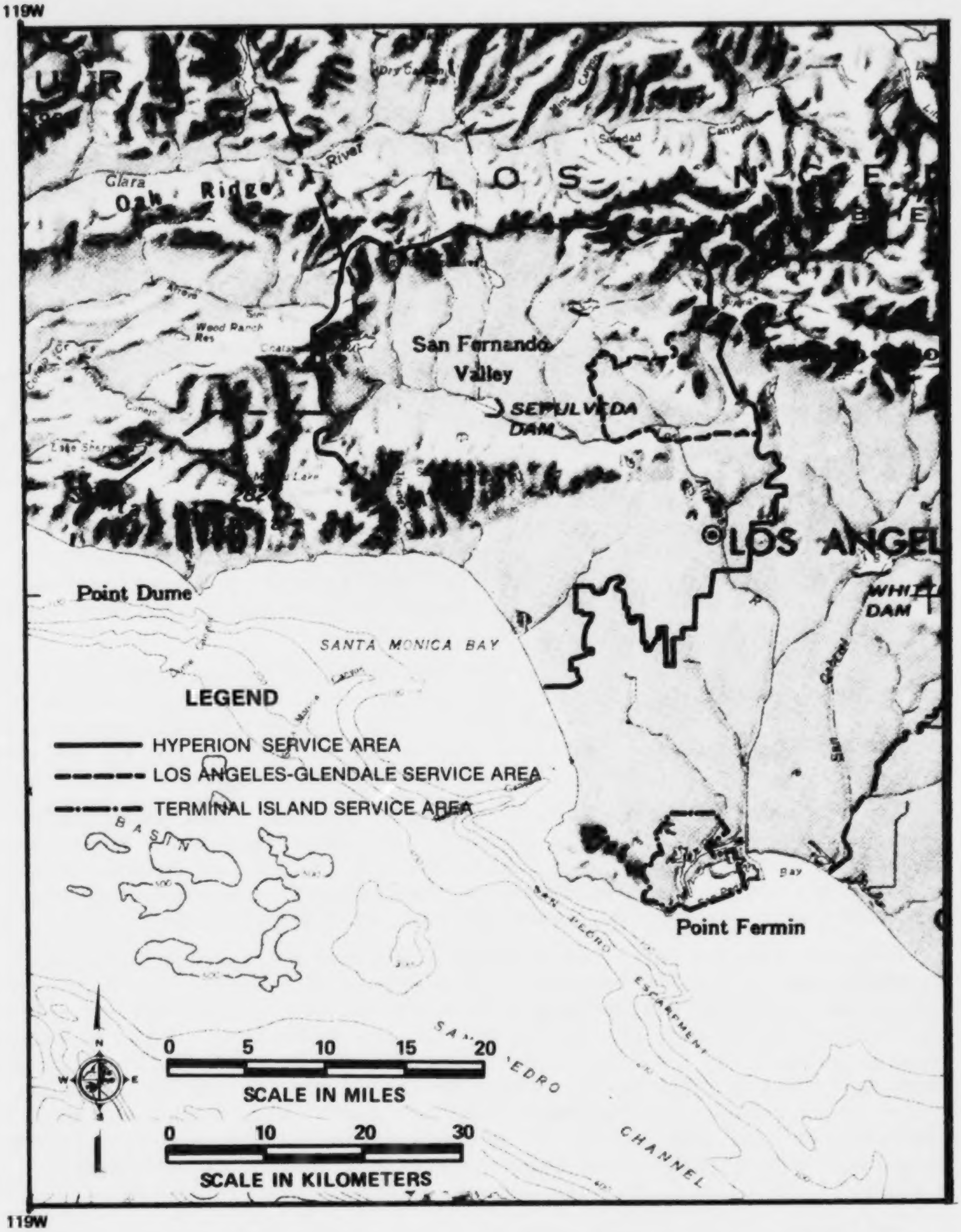

119W
Clara
Oak Ridge
River
LOS
San Fernando Valley
SEPULVEDA DAM
LOS ANGEL
WHITT
DAM
Point Dume
SANTA MONICA BAY
LEGEND
HYPERION SERVICE AREA
LOS ANGELES-GLENDALE SERVICE AREA
TERMINAL ISLAND SERVICE AREA
BASIN
SAN PEDRO ESCARPMENT
Point Fermin
Bay
SAN PEDRO CHANNEL
N
W
E
S
0 5 10 15 20
SCALE IN MILES
0 10 20 30
SCALE IN KILOMETERS
119W

198P-13

Figure GS-6. Physical characteristics of the Los Angeles Basin.

2 miles inland from the Los Angeles Harbor. All groundwater in the upper 400 feet of sediments in this area is saline due to seawater intrusion and percolated industrial wastes.

A satellite infrared photograph, which appears on the cover of this document, shows the physical features of the Los Angeles Basin. Well-watered vegetation, including golf courses and parks, are in deep red in the photograph. Well vegetated mountainous areas are reddish, water areas are dark, and concrete and developed areas are various shades of green. The hilly Palos Verdes Peninsula and the Harbor area to the right are clearly visible in the lower center of the photograph. The Terminal Island Treatment Plant is located in the Harbor area to the east or right of the Peninsula. The coastal plain can be clearly seen and the marina at Marina del Rey is visible. Ballona Creek drains into the Santa Monica Bay immediately adjacent to the marina. South of the marina, the runway for the Los Angeles International Airport can be distinguished. The Hyperion Treatment Plant is adjacent to the ocean near the end of the runway.

b. Meteorology and Air Quality.

(1) METEOROLOGY. Meteorological conditions in the Los Angeles Basin are governed by a strong high pressure cell over the Pacific Ocean which moves cool marine air into Los Angeles at the surface. Warmer air aloft which slowly sinks or subsides on the eastern edge of the high pressure cell creates a warm air cap over the cooler marine air. Since air is usually cooler at higher altitudes, this warm air over cooler air creates an inverted condition normally referred to as an "inversion." This warm air lid effectively prevents the cooler wedge of marine air from mixing upwards and traps pollutants close to the ground. Figure GS-7 shows the typical well-established late afternoon onshore flow of moist marine air.

Surface heating along the coast can be sufficient to produce afternoon clearing along with the cool onshore breezes, although these breezes are typically 5 knots (6 mpg) or less during the summer months. The trapped pollutants interact with solar radiation to produce photochemical "smog" which occasionally does not completely dissipate from the atmosphere during the night. The next day's inversion again traps the onshore marine flow between the mountains and the slowly sinking air aloft, resulting in a continuing air pollutant build-up.

The other major factor influencing summer meteorological conditions in the Los Angeles Basin is the inland low pressure system over Arizona. This system combined with the Pacific high generates a west to east air flow that tends, along with the normal subsidence, to keep the California Coast under the marine inversion influence during summer months. Factors that contribute to a decrease in the pollutants and an improvement in air quality are the major changes in the weather pattern that occur. Cold fronts pass during the winter months, and flow from the inland mountains occurs as "Santa Anas" occasionally. Both phenomena replace polluted air with cleaner air as strong wind flow carries the pollutants out to sea.

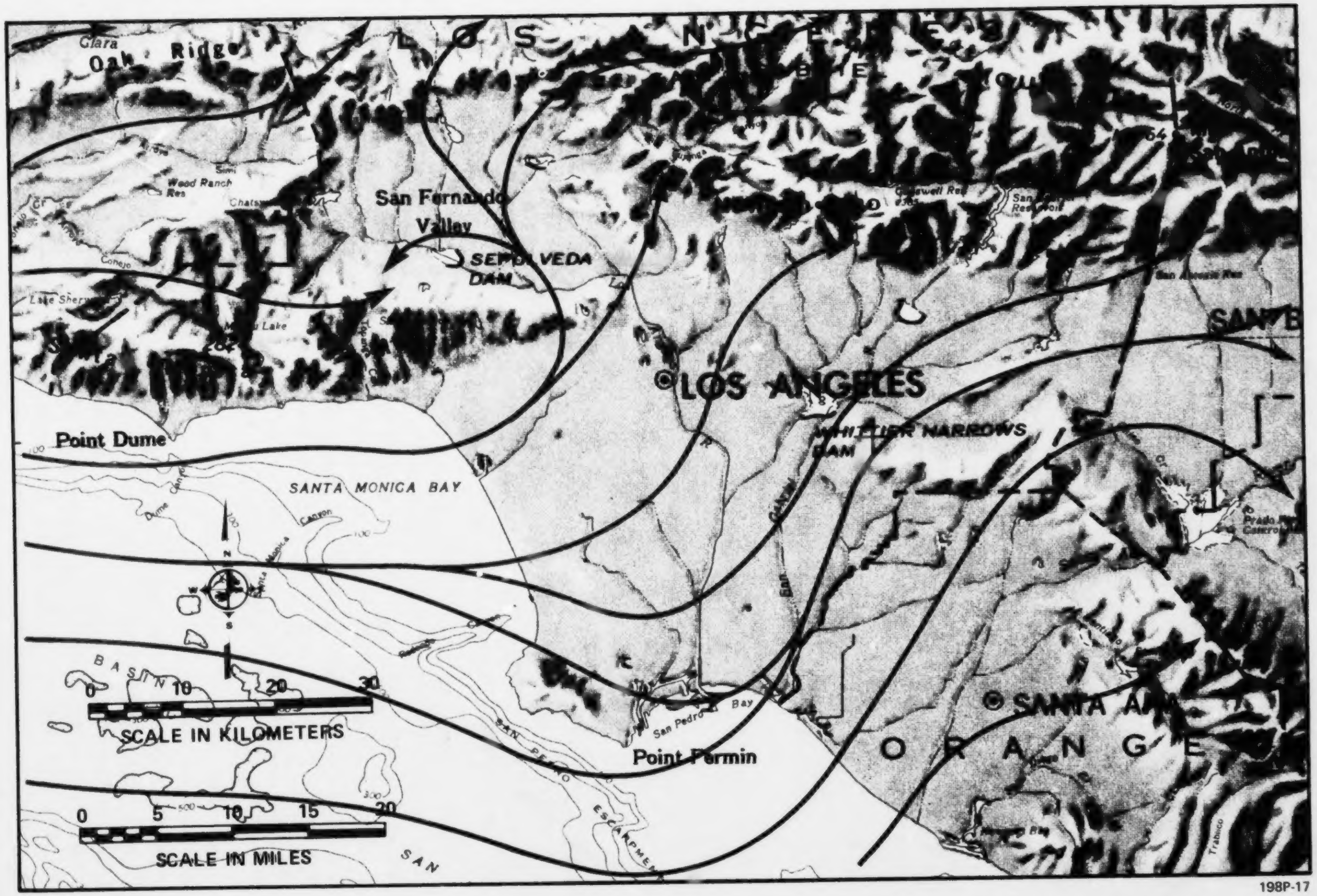

Clara
Oak Ridge
L O S A N G E L E S
Wood Ranch Res
Chatsworth
San Fernando Valley
SEPULVEDA DAM
Conejo
Lake Sherwood
Topanga
Point Dume
SANTA MONICA BAY
Dume Canyon
Santa Monica Canyon
Cogswell Res
San Gabriel Reservoir
San Antonio Res
LOS ANGELES
WHITTIER NARROWS DAM
SAN B
Prado Res
San Pedro Bay
Point Fermin
SANTA ANA
O R A N G E
Trabuco
B A S I N
SAN PEDRO ESCARPMENT
S A N
0 10 20 30
SCALE IN KILOMETERS
0 5 10 15 20
SCALE IN MILES
N
S
W
198P-17

Figure GS-7. Late afternoon on-shore flow of moist marine air is trapped against the mountains and sinking air aloft. Note the circulation of air in the San Fernando Valley.

Although the prevailing directions of summer and winter wind patterns appear to be similar (daytime sea breeze, nighttime land breeze), the sea breeze flow is least well marked in winter, being disrupted by fronts, troughs, and Santa Ana type winds. This lack of persistent undirectional flow in winter results in the lowest seasonal net horizontal transport of air. In summer, a much stronger sea breeze flow may penetrate farther inland and continue through the coastal mountain passes, frequently lasting through the night without reversal. Contaminated air parcels are transported inland to the San Gabriel Valley and beyond. The greater distance of travel in summer, the larger amounts of solar radiation to which contaminants are subjected, and the persistent elevated inversion combine to enhance photochemical reactions. Therefore, in the inlands valleys and at the ends of the transport paths, high oxidant concentrations are observed in summer, although considerable dilution has occurred as the air traveled inland. If morning wind speeds are low, high oxidant concentrations may be produced before the air parcels move very far into the inland valleys.

(2) AIR QUALITY. The study area air quality can be classified as highly polluted. Existing air quality standards for oxidant, carbon monoxide, nitrogen dioxide, suspended particulate matter, sulfates, lead, hydrocarbons, and visibility are exceeded. The most serious air pollution problem results from oxidants and carbon monoxide.

Oxidant levels exceed the federal standard more than 14 days per month for half of the year (Figure GS-8) and are particularly high during

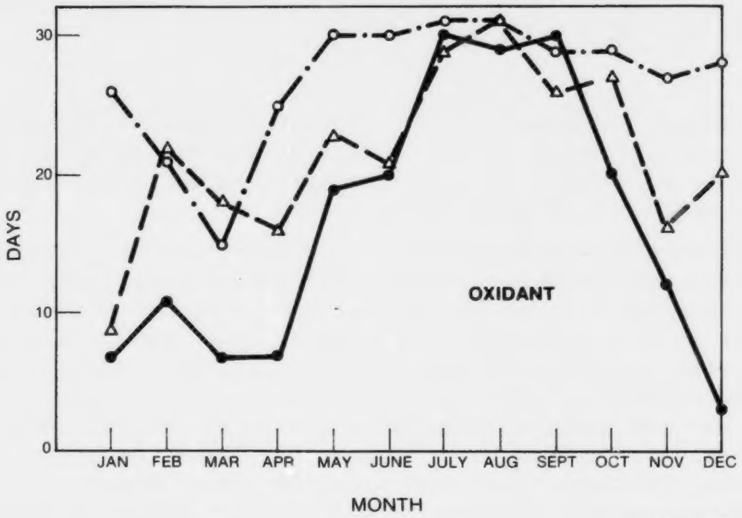


Figure GS-8. Number of days the state standard for total oxidant (1-hr avg 0.10 ppm) was equaled or exceeded in the Los Angeles Basin (SCAPD, 1975; presently SCAQMD).

the months when sunshine and inversion characteristics enhance photochemical reactions. Past emission trends for nitrogen oxides, reactive hydrocarbons, and carbon monoxide are shown in Figures GS-9, GS-10, and GS-11.

For these figures, estimates were made of the maximum emission levels that would be compatible with National Ambient Air Quality Standards (NAAQS). The asterisk on Figure GS-9 indicates the estimated emissions level at which the NAAQS of .05 ppm for NO_2 would not be exceeded. This estimate is based on the published 1974 NO_x emissions levels (Trijonis, 1976), and the average of daily 1-hour maximums observed for NO_2 air concentration for the year. The value indicated by the asterisk was determined by assuming a linear relationship between emissions and concentrations. It was further assumed that NO_2 is a constant fraction of NO_x.

An approach using hydrocarbon emissions and maximum air quality observations for ozone results in an allowable emissions level estimate as shown by the asterisk in Figure GS-10. Data for this estimate were taken from a Jet Propulsion Laboratory study (Stephenson, 1975).

A similar calculation for carbon monoxide gives an estimate as shown in Figure GS-11, using early 1970's data (Trijonis, 1976) for air concentrations, and emissions as reported in 1974.

(a) Summary of Existing Air Quality Effects.

EFFECTS ON HUMAN HEALTH. The effect of air pollution on the human environment and particularly on human health is of primary concern in the study of air quality.

Photochemical Oxidants—Of all the air pollutants, oxidants pose the greatest threat to health in our state. Oxidants also affect vegetation and may damage materials. Concentrations of oxidants are used as an indicator of the severity of photochemical smog.

A study on the health effects of ozone was recently completed as part of a California Air Resources Board (ARB) research program. The study showed that exposures to concentrations of 0.3 ppm or more of ozone for two hours or more (a condition which occurs occasionally in the South Coast Air Basin) with intermittent light exercise can have significant deleterious effects on health. Some persons thus exposed not only developed measurable physiological and biochemical changes but felt physically ill and were unable to perform their normal jobs during exposure and for several hours afterward. The most sensitive persons were generally those with history of asthma, allergy, or previous subjective adverse reactions to smog exposure. The least sensitive persons tested did not develop respiratory symptoms or physiological changes but did exhibit biochemical changes.

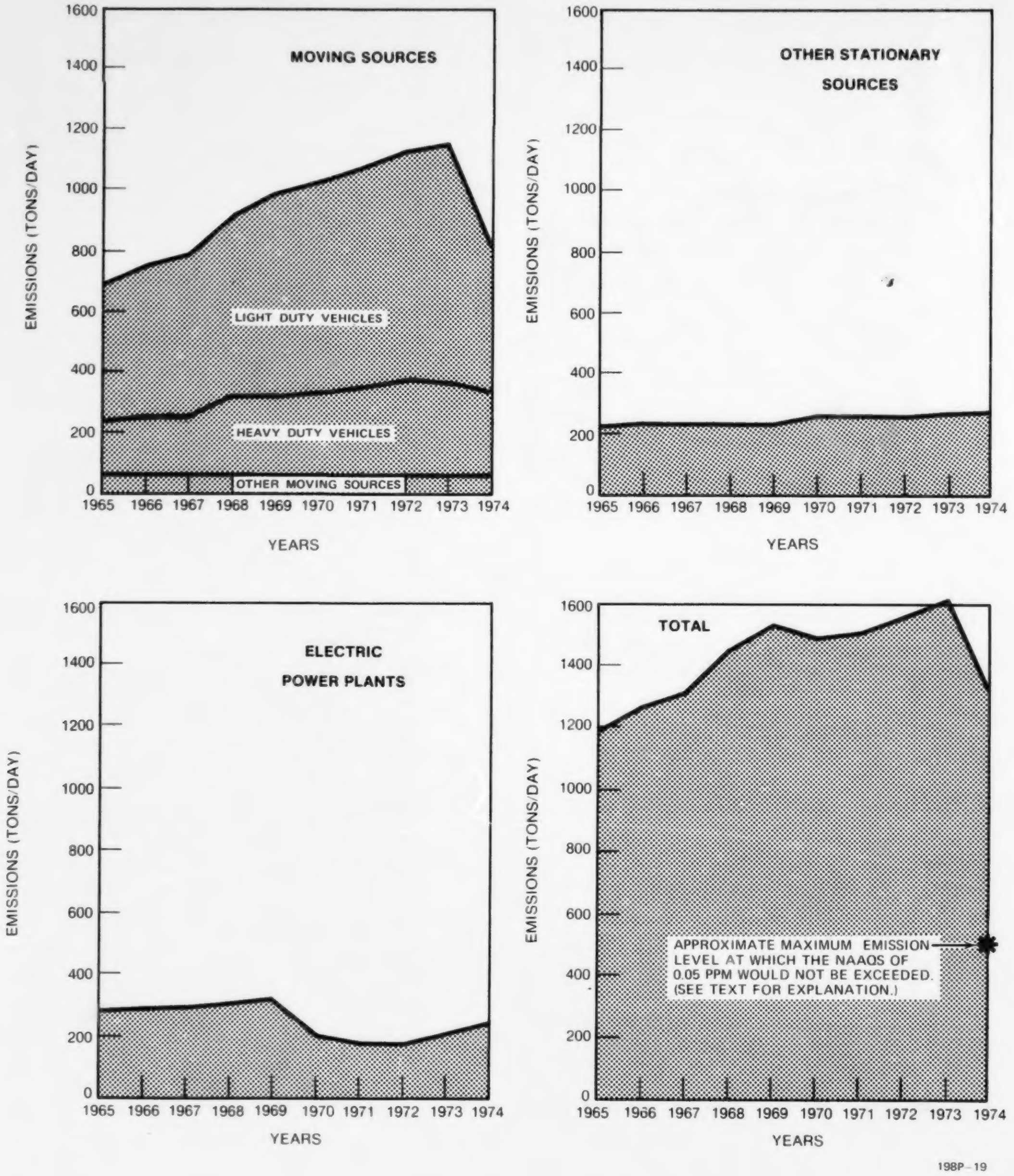


Figure GS-9. South Coast Air Basin trends in oxides of nitrogen emissions (Trijonis, et al., 1976).

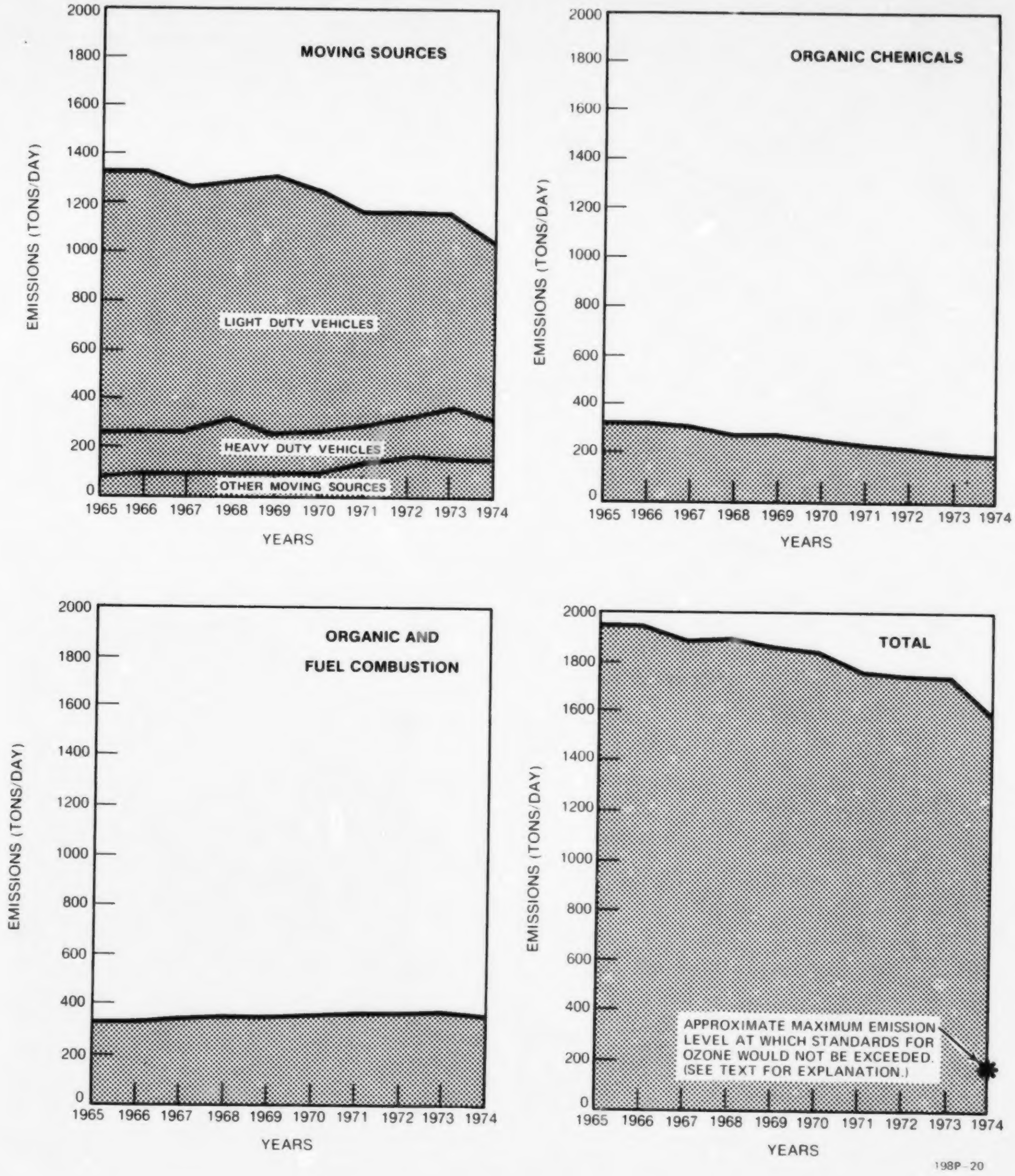
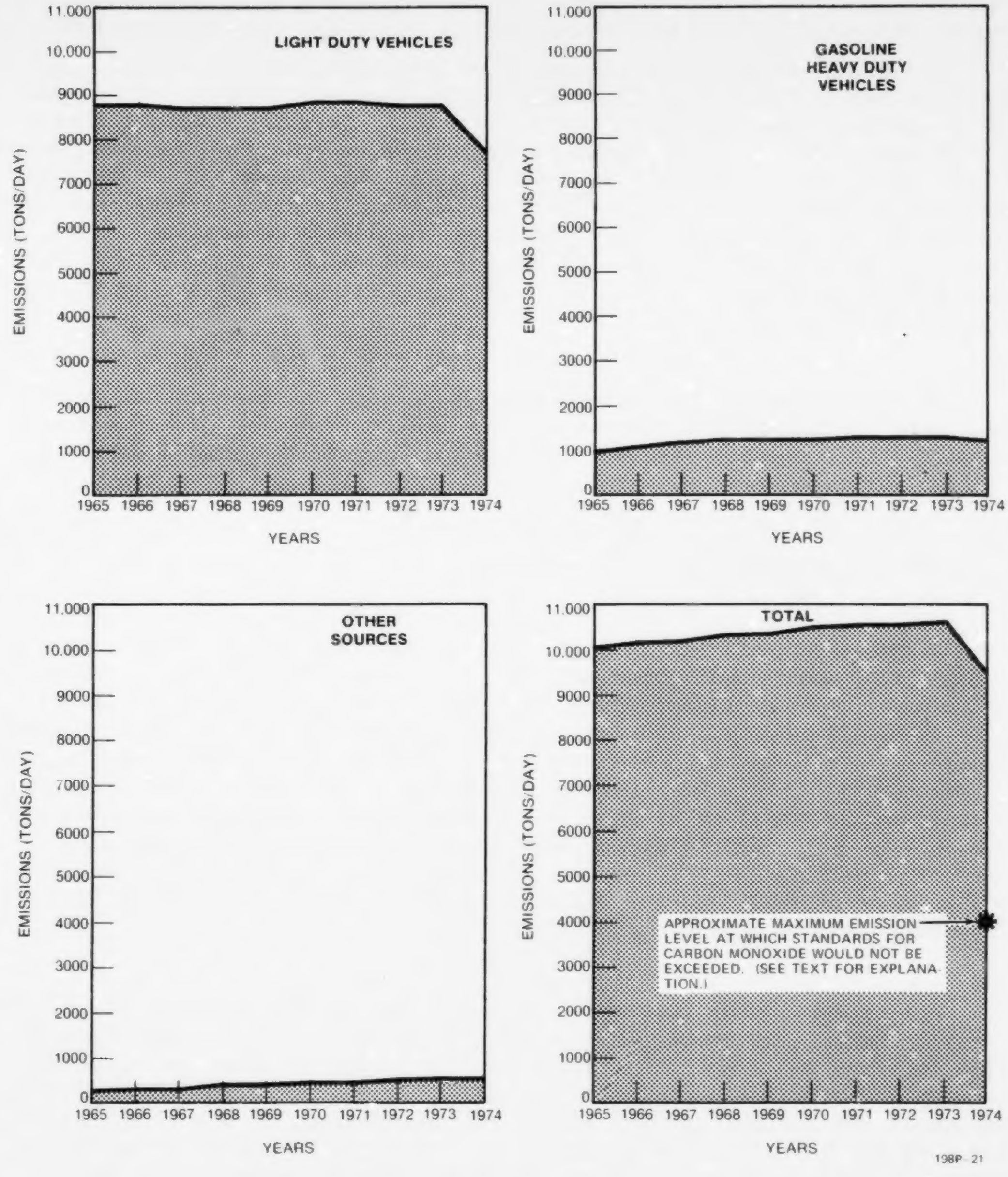


Figure GS-10. South Coast Air Basin trends in reactive hydrocarbon emissions (Trijonis, et al., 1976).



APPROXIMATE MAXIMUM EMISSION LEVEL AT WHICH STANDARDS FOR CARBON MONOXIDE WOULD NOT BE EXCEEDED. (SEE TEXT FOR EXPLANATION.)

Figure GS-11. South Coast Air Basin trends in carbon monoxide.

These findings relate to relatively healthy, young to middle-aged adult men performing light exercise. Other groups—such as children, older adults, pulmonary disease patients, or workers performing heavy exercise—may be at risk at even lower ozone levels, the research study concluded.

The mechanism by which components of smog irritate the eyes is unknown; but in heavily polluted regions such as Los Angeles, 75 percent of the populace may experience eye irritation. As a defense, the tear glands may produce copious tears in an attempt to wash away the irritating agent. Many of the oxidants of photochemical-smog cause eye irritation, particularly the PANs. Studies in Los Angeles have demonstrated that eye irritation increases over the range of instantaneous oxidant concentrations from 0.05 to 0.45 ppm although no clearly demarcated threshold level for this effect is apparent (EPA, 1976, *Photochemical Oxidants in the Ambient Air of the United States*).

Aerosols—The effects of sulfates upon human health have not been adequately defined. The Federal EPA has stated that the "best judgment exposure threshold for adverse effects" for long-term (annual) exposure is 9 to 14 micrograms per cubic meter.

EFFECTS ON PLANTS.

Plant Damage—Sulfur dioxide (SO_2) damages the leaves of some plants exposed to a sufficient concentration and dosage. Apparently a threshold does exist because plants exposed to only low concentrations are able to take in small amounts of SO_2 through the stomata and dispose of it without damage. The SO_2 tends to be oxidized to sulfates in the cells of the leaf. Concentrations above the threshold for a particular plant cause deterioration of the internal cells and leaf discoloration. Spinach, lettuce, and some other leafy vegetables are very sensitive as are cotton and alfalfa. Many other plants are moderately sensitive. Most plants display maximum sensitivity in sunlight when the stomata are open and the plants are engaged in strong physiological activity.

Agricultural Crop Losses—If air pollutant concentrations (particularly oxidants) are not reduced, economic losses to agricultural interests will continue to climb. The California Department of Food and Agriculture has estimated that air pollution caused $55.1 million worth of agricultural damage in the state in 1974. Of far greater concern is the fact that there are over 20 crops that can no longer be grown commercially in the South Coast Air Basin because of their susceptibility to damage by air pollution (ARB, 1976).

Damage to Forests—Photochemical oxidant air pollution generated in the urban areas of Southern California is now weakening and killing millions of valuable pines in the forests of the Angeles, San Bernardino, Cleveland, and Los Padres National Forests. Oxidant damage is evident in every major stand of yellow pine in the Angeles National Forest, and heavy damage is evident in the San Bernardino National Forest (Figure GS-12). Ozone has been shown to be responsible for much of the damage. It causes premature aging and reduced photosynthetic capabilities which in turn reduces growth and wood production according to a plant pathologist with the U.S. Forest Service (W. T. Williams, 1975). This decline in the health of the trees, in turn, is "contributing to increased fire hazards, insect and disease problems, and resulting in potential successional patterns of forest ecosystems that are unfavorable for optimum and necessary resource yields and utilization."

This problem has been found in the Sierra Nevadas among a variety of species. Ponderosa and Jeffrey pine of the Sequoia and Kings Canyon National Parks are affected by oxidants formed from emissions of hydrocarbon and oxides of nitrogen. Williams concludes that low elevation forests on the Hume Lake District of the Sequoia National Forest, Kings Canyon, and Sequoia National Park receive chronic doses of air pollutants generated in the Central Valley of California and probably from such distant sources as the San Francisco Bay Area. From this it may be concluded that air pollutants from the South Coast Air Basin could easily be transported by wind to the Cleveland and San Bernardino National Forests where vegetation damage can and does occur.

EFFECTS ON BUILDING MATERIALS—Prolonged exposure to sulfurous smogs has caused serious damage to building marble, limestone, and mortar because the carbonates in these materials are replaced by sulfates (as $CaSO_4$ or gypsum, $CaSO_4 \cdot 2H_2O$), and these sulfates are soluble in water. Consequently, over a period of time, rain removes the altered minerals. The damage may be accompanied by discoloration from aerosols that adhere to the surface and deposit their burden of chemicals.

The potential for sulfur smogs in the Los Angeles area is great, particularly with natural gas supplies becoming unavailable. Other substitute fuels contain as much as 40 times as much sulfur as natural gas.

(b) Regional Dispersion of Air Pollutants.

Air pollutant emissions from activities in the study area not only affect local air quality but can be carried directly or transformed in the atmosphere and carried by prevailing winds to other areas. The regional nature of the air pollution problem in Southern California is well known. As shown by the prevailing daytime wind flow patterns, pollutants emitted within the study area are blown inland to Riverside County.

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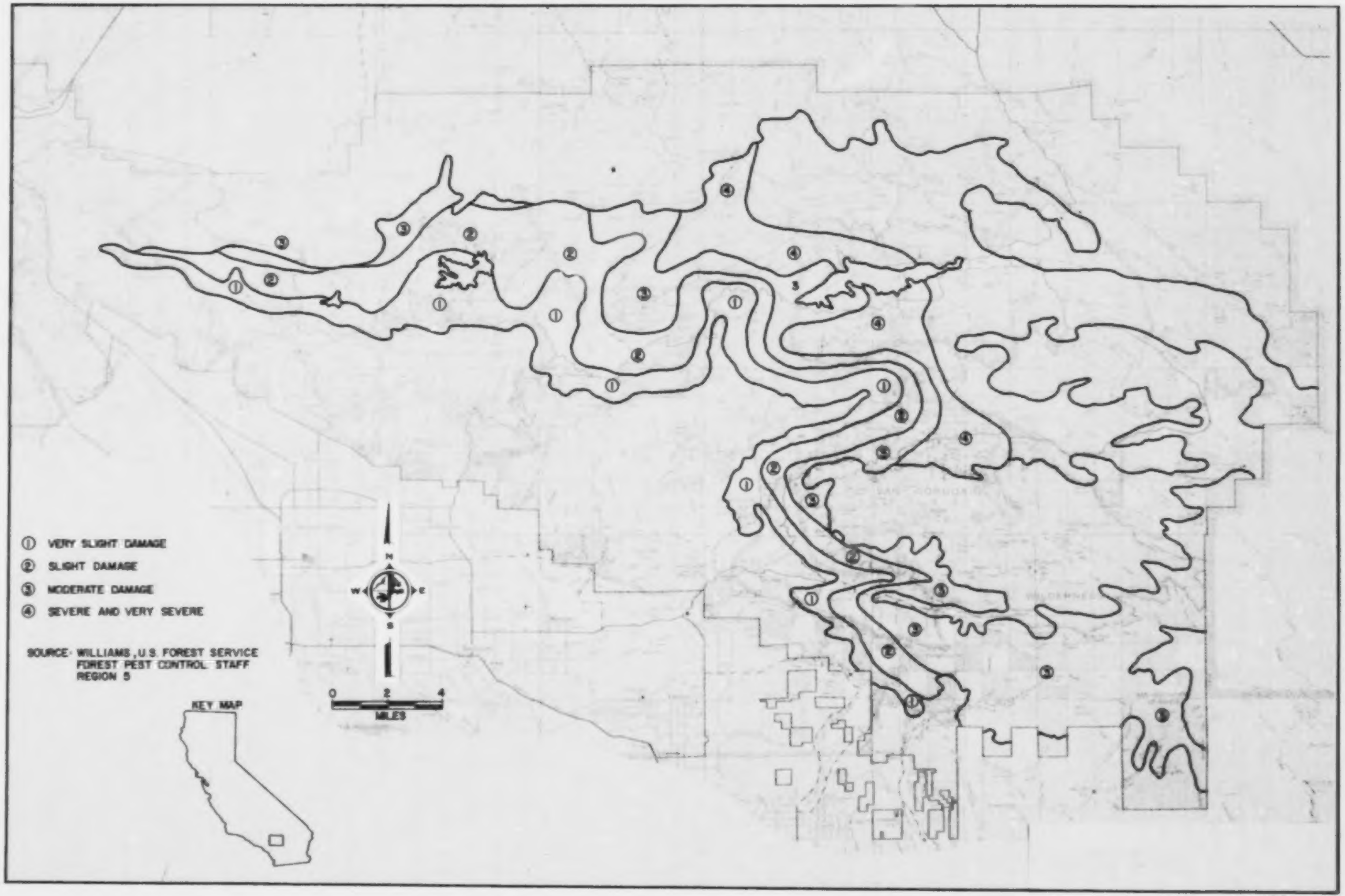
① VERY SLIGHT DAMAGE
② SLIGHT DAMAGE
③ MODERATE DAMAGE
④ SEVERE AND VERY SEVERE
SOURCE: WILLIAMS, U.S. FOREST SERVICE FOREST PEST CONTROL STAFF REGION 5
KEY MAP
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2
4
MILES

198P-412

Figure GS-12. Air pollution damage in the San Bernardino National Forest.

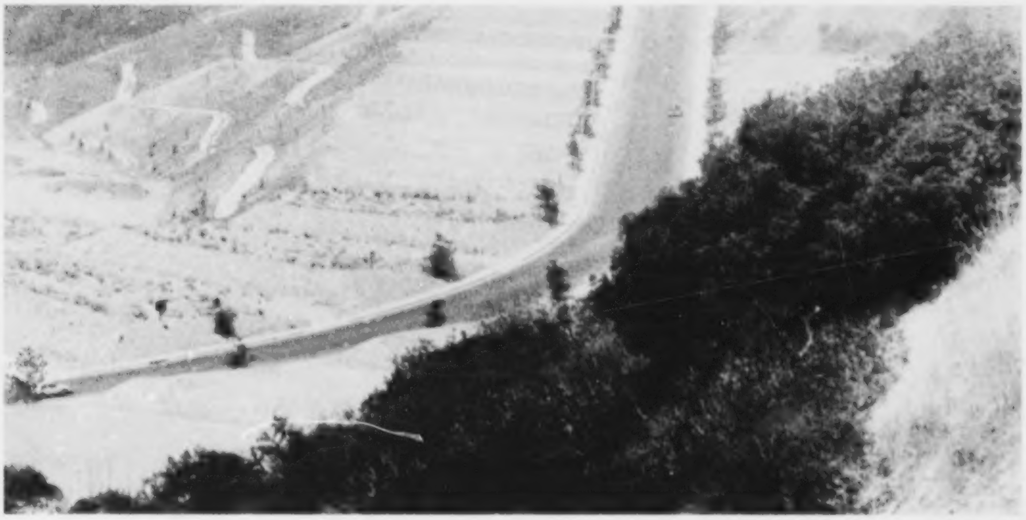
2. TERRESTRIAL BIOLOGY

The City of Los Angeles is a heavily urbanized community in which the majority of the terrestrial biology consists of horticultural vegetation and animals which prefer the urban environment. At the fringes, however, and in central areas that have remained undeveloped there are local remaining or reestablished areas of the natural biology.

The Los Angeles Basin is, by nature, an arid environment with highly seasonal rainfall occurring only in the winter. The native vegetation of the lower coastal plain, inland valleys, and low hills is adapted to withstand months of hot, dry weather and annual rainfalls of less than 25 inches. The vegetation of the coastal plain was once a coastal sage scrub, half composed of woody shrubs. Relicts of this scrub occur on hillsides but it has generally been replaced with urban landscaping. The San Fernando Valley was once vegetated with a mix of coastal scrub and valley grassland, largely replaced with agricultural crops, and subsequently with horticultural landscaping.

Figure GS-13 shows coastal sage scrub giving way to housing construction in the San Fernando Valley. At the western extreme of the San Fernando Valley the terrain is extremely rugged with sparse, woody vegetation in a rocky substrate.

In lower canyons, and on some open slopes of the Santa Monica and San Gabriel Mountains, there is an open Southern Oak Woodland with oaks, walnut, sycamore and elderberry, and at higher elevations there is a yellow pine forest.



198P-22

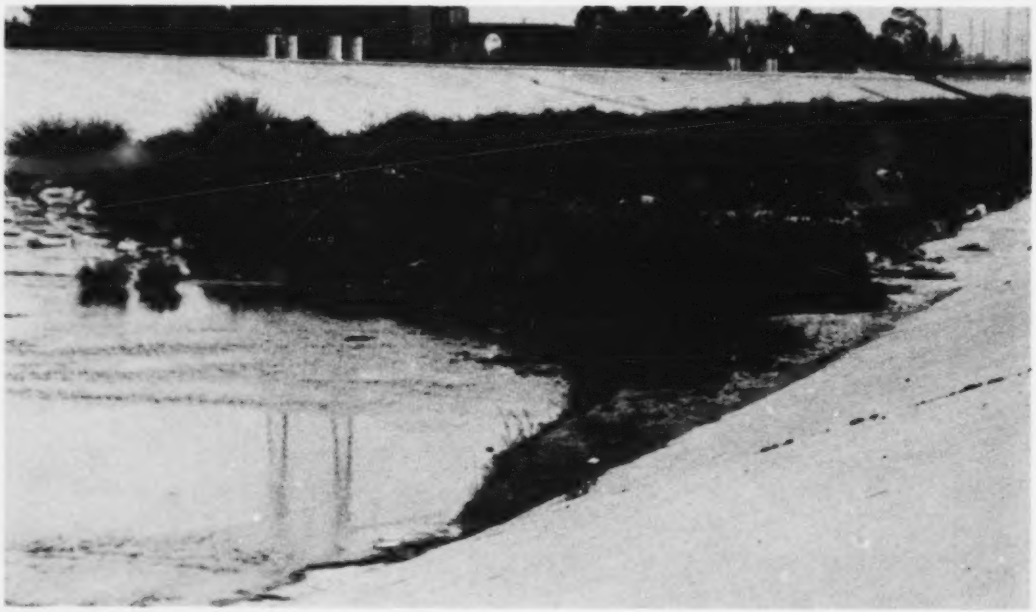
Figure GS-13. Coastal sage scrub being replaced with houses in the San Fernando Valley.

In the unlined portions of the Los Angeles River [a 7-mile stretch upriver from the Los Angeles Narrows, around the terminus of the Santa Monica Mountains and Griffith Park (Figure GS-14] there is a well-developed herbaceous vegetation with an occasional willow.

At the coast there are remnants of the coastal strand plant communities on the sandy beaches and dunes. An endangered species of butterfly, the El Segundo blue, is limited in range to portions of the coastal strand community near, but not on, the Hyperion Treatment Plant site. Adjacent to Ballona Creek on the South is a wetland with elements of both coastal salt marsh and freshwater marsh.

Each of these terrestrial and freshwater habitats (including particularly the horticultural one of residential plantings) supports a characteristic and often diverse group of birds. Whenever patches of undisturbed vegetation exist there are a number of amphibian, reptile, and rodent species which may occur, and in the more extensive park and canyon areas larger mammals including racoons, opossum fox, and deer can be found as well.

Site specific terrestrial biology is discussed in Chapter II, but none of the proposed project elements is expected to have serious adverse impacts on significant natural areas, or rare or endangered species except as follows. The proposed Hyperion sludge drying beds option for the area west of the airport was discarded when it was made known that the endangered butterfly, the El Segundo blue, inhabited the area. It has been proposed



198P-25

Figure GS-14. Water flowing into an unlined portion of the Los Angeles River in the narrows east of Griffith Park.

that sludge beds for the Terminal Island system be located adjacent to the nesting sites of the endangered Least Tern. If this project if pursued, it should be dealt with by an amendment to the Environmental Impact Report for the Terminal Island Treatment Plant since mitigative measures for adverse impacts to the Least Tern are not covered in this EIS.

The significance of the alterations of the terrestrial/freshwater biology depends on a subjective judgment of the importance of the existing biology at areas to be affected. One such selection of areas of ecological importance is shown in Figure GS-15 from the City of Los Angeles Conservation Plan. The areas identified include only those of fairly large geographic size which are presently either undeveloped, developed as parks, or reverting slowly to a natural state (such as the airport dunes). To these might be added the unlined sections of the Los Angeles River which, although narrow, provide an unbroken linear corridor of vegetation of value to a variety of animals; areas of agricultural land and of golf courses (such as those within the Sepulveda Flood Control Basin) which provide an animals habitat not found elsewhere in the Los Angeles vicinity; heavily vegetated residential areas such as Beverly Hills, which with their complex vegetation and human source of food provide a productive bird habitat; and wetlands in various stages of management (such as those adjacent to Ballona Creek near Marina del Rey) which are representative of a coastal habitat that has all but disappeared in Southern California.

The natural areas in National Forests do not depend on artificially supplied water and any effects of the Facilities Plan on them will be the result of altered public utilization and of altered air quality. The Angeles National Forest in the San Gabriel Mountains and the San Bernardino National Forest in the San Bernardino Mountains, both contain populations of a number of trees (Griffen and Critchfield, 1972) known to be sensitive to photochemical smog (Williams, undated). Other areas of natural vegetation, less sensitive to the effects of air pollutants, and not requiring supplemental water (other than that from natural precipitation) for maintenance include water areas such as the Baldwin Hills and the Airport Dunes.

Many areas of biological interest do require supplemental water for maintenance and those include residential, agricultural, and landscaped park areas as well as river bottoms, estuarine zones, and wetlands. In these areas the type of vegetation and animals present as well as their number is strongly related to the amount of water supplied. Impacts of the Facilities Plan on these areas will be strongly dependent on the amounts and uses of reclaimed water generated.

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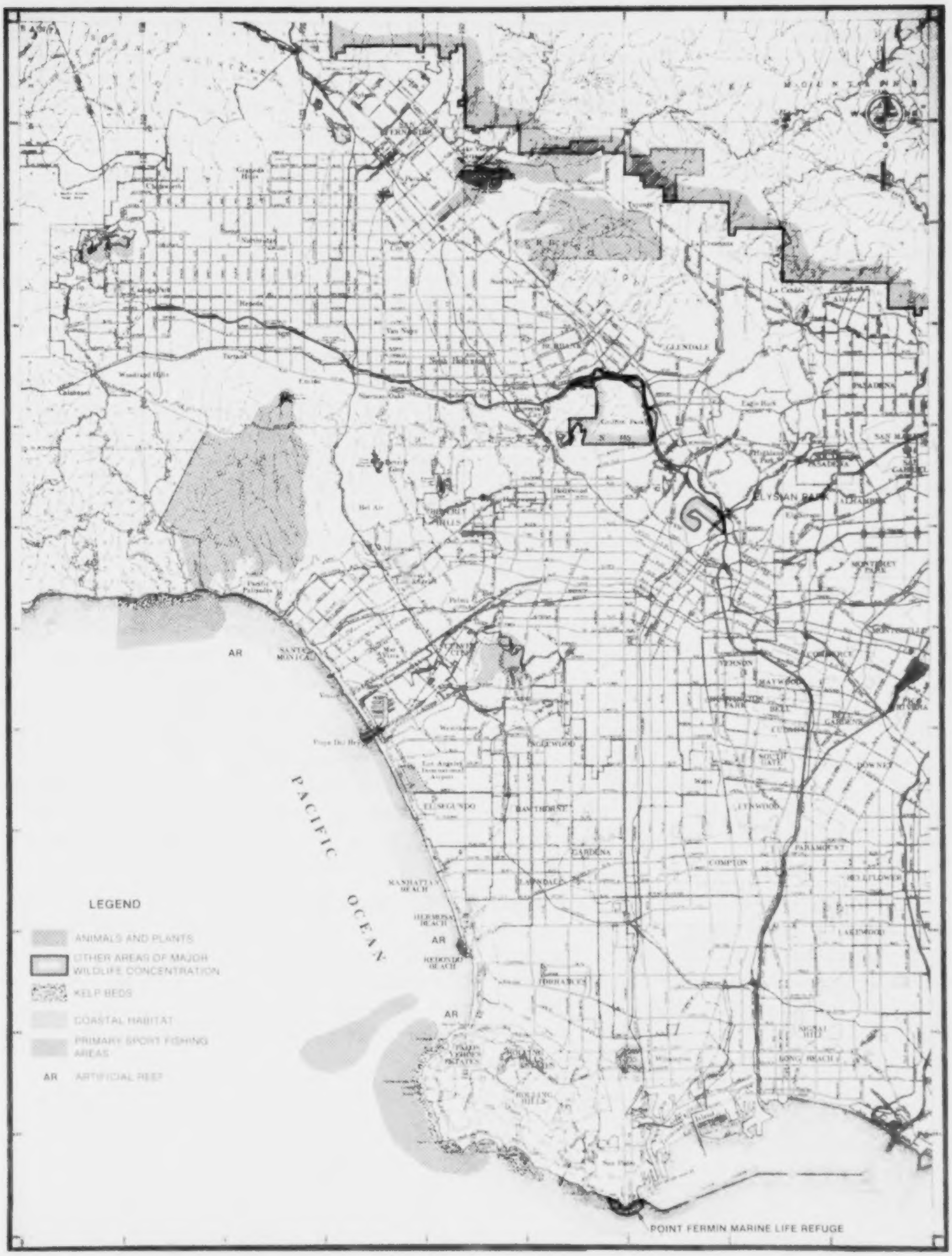

LEGEND
▨ ANIMALS AND PLANTS
▭ OTHER AREAS OF MAJOR WILDLIFE CONCENTRATION
▩ KELP BEDS
░ COASTAL HABITAT
▨ PRIMARY SPORT FISHING AREAS
AR ARTIFICIAL REEF
PACIFIC OCEAN
AR
AR
AR
SANTA MONICA
GLENDALE
PASADENA
ELYSIAN PARK
MONTEREY PARK
INGLEWOOD
EL SEGUNDO
HAWTHORNE
GARDENA
COMPTON
LYNWOOD
PARAMOUNT
BELLFLOWER
LAKEWOOD
DOWNEY
VERNON
BELL
SOUTH GATE
MANHATTAN BEACH
HERMOSA BEACH
REDONDO BEACH
TORRANCE
SIGNAL HILL
LONG BEACH
POINT FERMIN MARINE LIFE REFUGE

Figure GS-15. Ecologically important areas. 198P-28

3. MARINE ENVIRONMENT

a. Physical Oceanography. The seafloor topography of the California marine borderland is of unusual relief due, in part, to extensive modification by submarine erosional processes. Physical features are shown on Figure GS-16. The coastal shelf in the Santa Monica and San Pedro area is relatively narrow and in some places water 300 feet deep may occur less than one mile from shore. The deepest nearshore waters are at the head of submarine canyons. There is a pronounced flattening of the seafloor at the 2,400-foot depth contour which may vary from as close as 4 miles from shore to as far out as 20 miles. Shoreward from the 300-foot depth contour the seafloor is usually quite flat and featureless.

The Southern California Bight is the open embayment of the Pacific Ocean approximately 300 miles long and 125 miles wide extending from Point Conception on the north to Cabo Colnett, Baja California, on the south. Its western boundary is roughly defined by the California Current, and the continental slope of Southern California at a depth of 10,000 feet.

Santa Monica Bay (Figure GS-16) extends from Point Dume on the northwest to Palos Verdes Point on the southeast, an airline distance of 24 miles with an indentation of approximately seven miles. The bay floor is fairly flat and slopes very gently in the westerly direction out to a depth of 300 feet where the slope abruptly steepens to a depth of 2,400 feet.

Physical oceanographic parameters, such as currents and upwelling are useful in determining the area of immediate impacts from wastewater discharges as well as the dilution and dispersion of effluent constituents throughout the Southern California Bight. The major currents in the Bight are the south flowing California Current which forms the western boundary of the Bight, the north flowing Southern California Countercurrent, and the California Undercurrent (Figure GS-17). The prevailing direction of currents at the depth of most outfalls in the Southern California Bight is parallel to shore, and the average speed is 8-10 cm/sec. However, currents in Santa Monica Canyon (HTP discharges are near the head of this canyon) frequently move offshore.

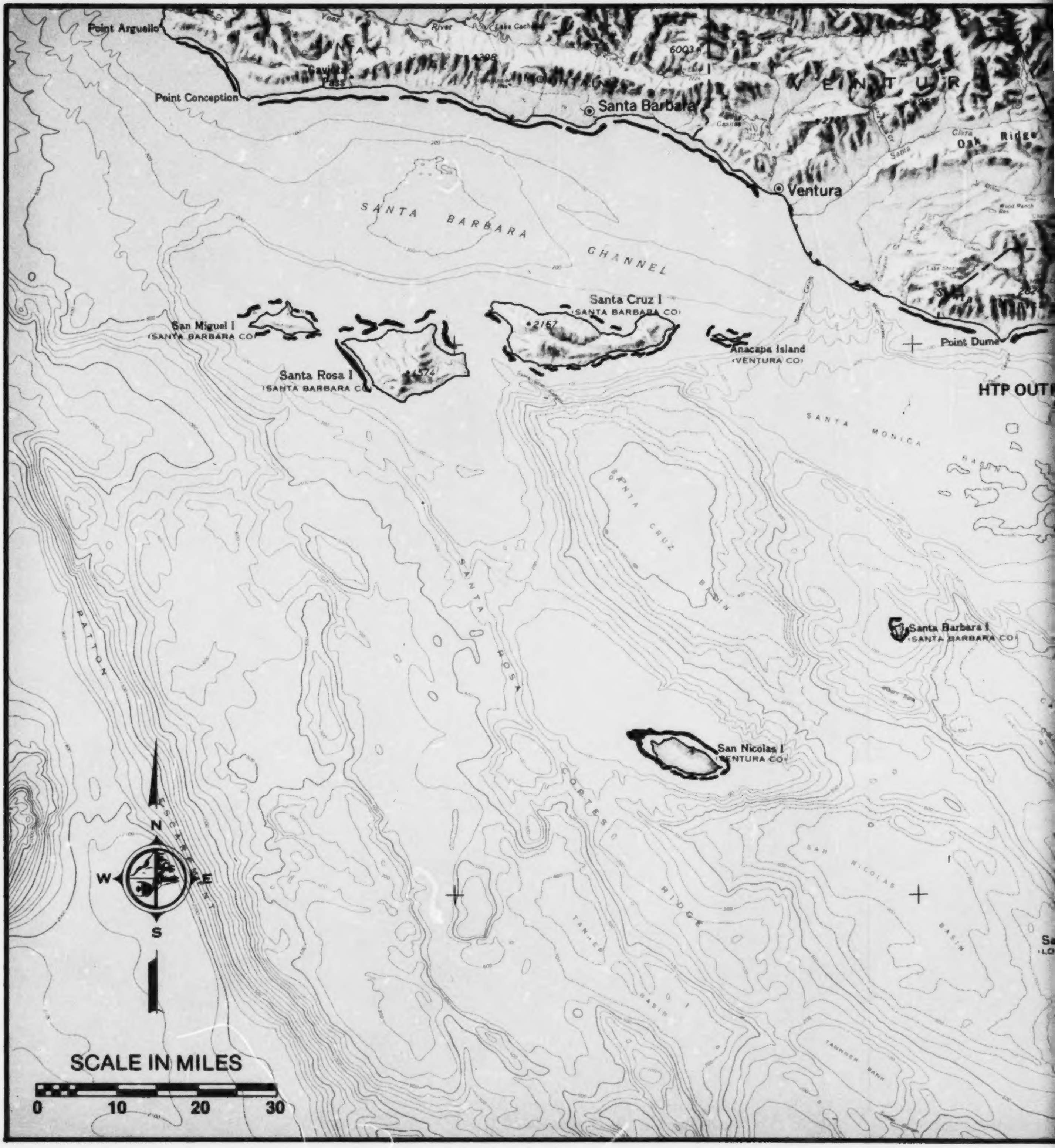
Circulation patterns in Santa Monica Bay have not been studied in the detail necessary to accurately model the spatial and temporal distribution of the HTP effluent plumes. The occurrence of oscillatory currents could result in accumulation of sewage constituents in the Bay. Stagnation currently does occur in the Bay.

Upwelling is an important physical mechanism by which deeper water strata are mixed with surface waters. This vertical water movement mainly occurs in the winter months and brings water of markedly different quality to the surface as a result of winds and horizontal water currents. Upwelling in the vicinity of the HTP outfalls may bring to the surface sewage constituents that would otherwise remain in deep water strata most of the time. These constituents (both nutrients and toxicants) would thus be directly available to surface organisms rather than directly or not at all.

Dissolved oxygen is low in the deeper waters of the three nearshore basins (San Pedro, Santa Monica, and Santa Barbara), as compared to the offshore basins, such as Santa Cruz and Santa Catalina, and the water at the extreme bottom of Santa Monica and Santa Barbara basins is anoxic. Bacterial decomposition of organic matter settling out from the natural high productivity (compared to offshore) of the nearshore surface waters is the cause of this oxygen depletion. Wastewater discharges may contribute to this organic matter directly or indirectly.

b. Wastewater and Other Inputs. Both natural and artificial inputs of chemical and physical substances occur continually throughout the Bight, and the major components of these inputs include water, nutrients, toxicant chemicals, sediments, dissolved gases, heat, bacteria, and viruses. In addition to many major industrial discharges into the waters of the Bight, 23 sewage treatment plants discharge continually, the second largest being the Hyperion Treatment Plant. Pollutants discharged from Terminal Island Treatment Plant into Los Angeles Harbor may also enter the Bight through currents and tidal flushing of the harbor. Tables GS-4 and GS-5 show the concentrations and mass emissions of the constituents in the two City discharges as compared with the other major south coast discharges. Municipal wastewater treatment plants discharge 74 percent of the total volume of all discharges into the Bight and more than 50 percent of the mass emissions of water quality parameters frequently measured (Figure GS-18). Other sources of inputs into the Bight include aerial fallout, surface runoff, and ocean dumping by seagoing vessels.

Most (>98 percent) of the wastewater from the Hyperion Treatment Plant is released from the 5-mile outfall, located at a depth of 57 m (188 ft) on the continental shelf in Santa Monica Bay, and sludge is released through the 7-mile outfall at a depth of 98 m (320 ft) at the head of the Santa Monica Canyon which leads to a deep ocean basin. Figure GS-19 shows an artist's conception of the location of these outfalls, and the distribution of substances released from them. The effluents from both outfalls rise because they are less dense than the surrounding seawater. The particulates suspended in these effluents settle out of the plume when their upward momentum stops, with the most dense particles settling closest to the outfalls. During the summer, there is usually a well-developed thermocline in Santa Monica Bay which prevents the transfer of water from the depth of the outfalls to the surface, so the effluent plumes are confined to, and dispersed within subsurface waters. During the winter, the thermocline disappears and the plumes may reach the surface. Figures GS-20 and GS-21 show measurements of the total coliform bacteria in the vicinity of the HTP discharge. These give a good indication of the short-term (until the coliforms die off) spread of the effluent field in summer and winter, although surface runoff is also evident in the winter.


Point Arguello
Point Conception
Santa Barbara
Ventura
VENTUR
Oak Ridge
SANTA BARBARA CHANNEL
San Miguel I
(SANTA BARBARA CO)
Santa Rosa I
(SANTA BARBARA CO)
Santa Cruz I
(SANTA BARBARA CO)
2167
Anacapa Island
(VENTURA CO)
Point Dume
HTP OUT
SANTA MONICA BASIN
SANTA CRUZ BASIN
SANTA ROSA
Santa Barbara I
(SANTA BARBARA CO)
San Nicolas I
(VENTURA CO)
CORTES RIDGE
SAN NICOLAS BASIN
TANNER BASIN
TANNER BANK
PATTON ESCARPMENT
N
S
E
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SCALE IN MILES
0
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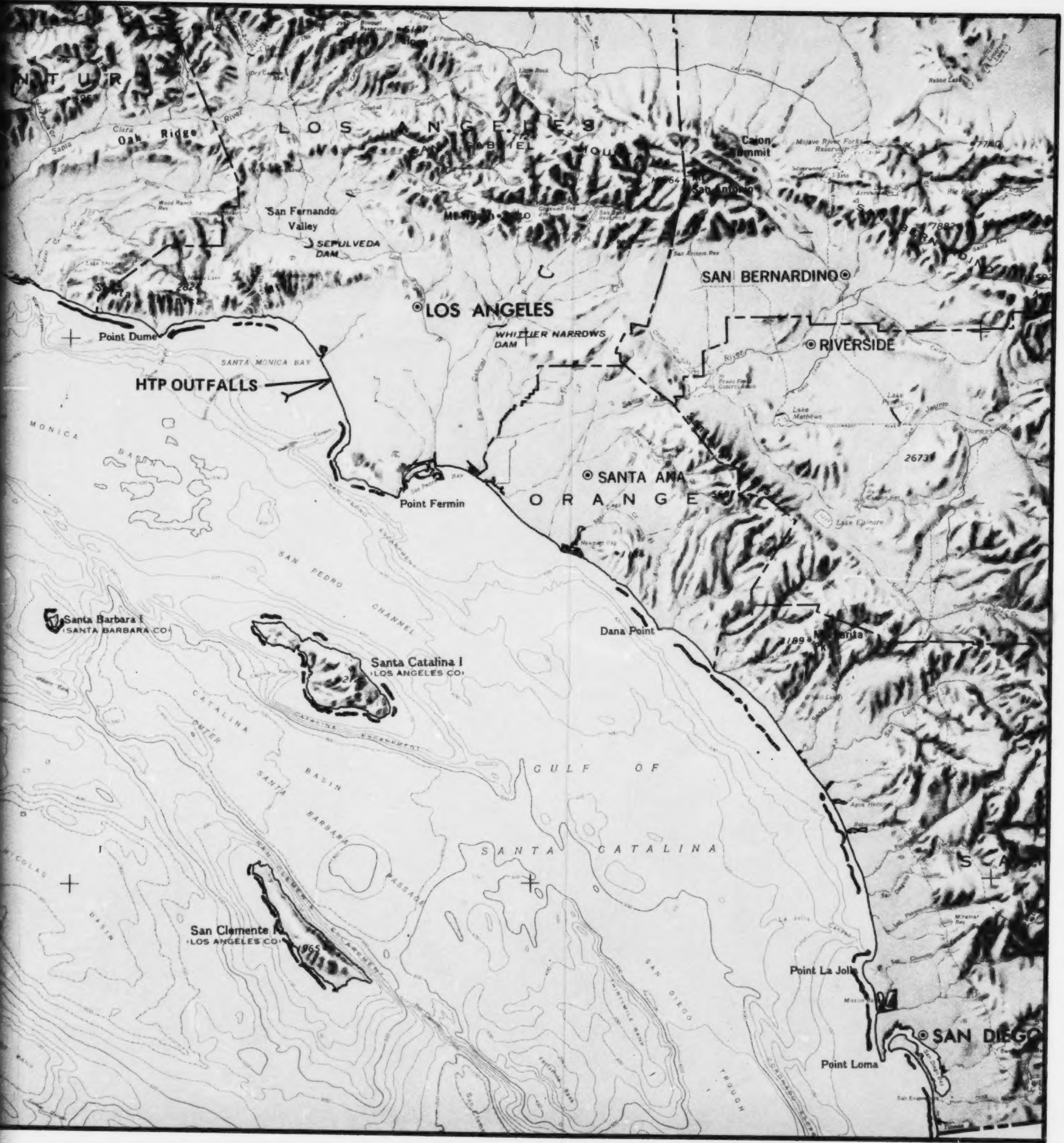
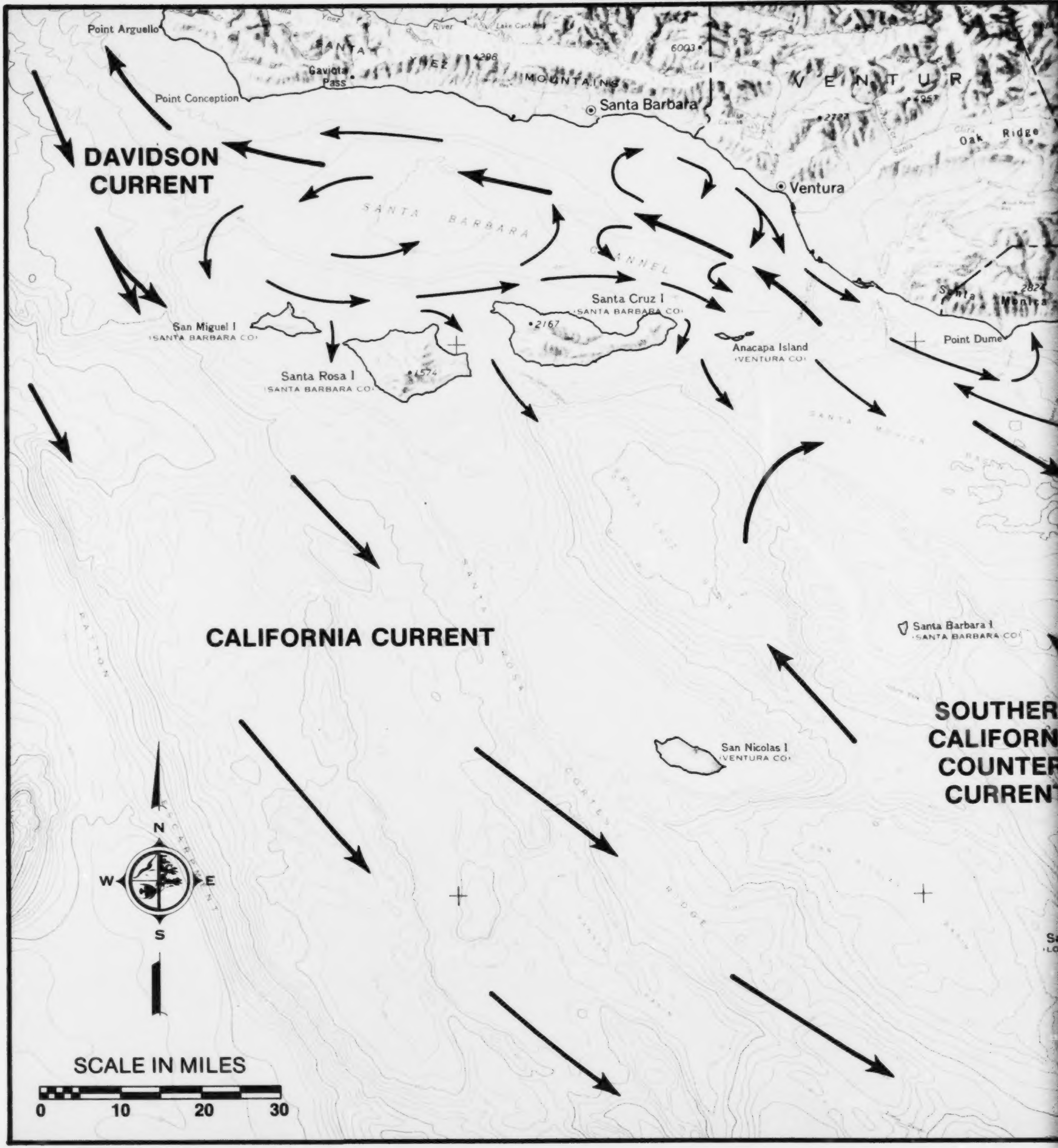
Figure GS-16. Base map showing general features of the submarine topography in the vicinity of Santa Monica Bay and San Pedro Bay. The Hyperion Treatment Plant outfalls and kelp beds are also shown.


LOS ANGELES
Oak Ridge
San Fernando Valley
SEPULVEDA DAM
Cajon Summit
San Antonio
SAN BERNARDINO
LOS ANGELES
WHITTIER NARROWS DAM
RIVERSIDE
Point Dume
SANTA MONICA BAY
HTP OUTFALLS
Point Fermin
SANTA ANA
ORANGE
Lake Elsinore
Lake Mathews
SAN PEDRO CHANNEL
Santa Barbara I
(SANTA BARBARA CO)
Santa Catalina I
(LOS ANGELES CO)
Dana Point
CATALINA BASIN
GULF OF SANTA CATALINA
SANTA BARBARA PASSAGE
San Clemente I
(LOS ANGELES CO)
SAN DIEGO TROUGH
Point La Jolla
SAN DIEGO
Point Loma

198P-270


Point Arguello
Point Conception
Gaviota Pass
SANTA YNEZ MOUNTAINS
Santa Barbara
V E N T U R
Ventura
Oak Ridge
DAVIDSON CURRENT
SANTA BARBARA CHANNEL
San Miguel I
SANTA BARBARA CO
Santa Rosa I
SANTA BARBARA CO
Santa Cruz I
SANTA BARBARA CO
Anacapa Island
VENTURA CO
Point Dume
Santa Monica
SANTA MONICA BASIN
CALIFORNIA CURRENT
PATTON ESCARPMENT
SANTA ROSA CORTES RIDGE
Santa Barbara I
SANTA BARBARA CO
SOUTHER
CALIFORN
COUNTER
CURREN
San Nicolas I
VENTURA CO
N
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SCALE IN MILES
0
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20
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Figure GS-17. Surface circulation (0 to 100m) in the Southern California Bight. The arrows indicate the approximate direction of flow (from Jones, 1971; Straughan, 1976). Depths are in fathoms.

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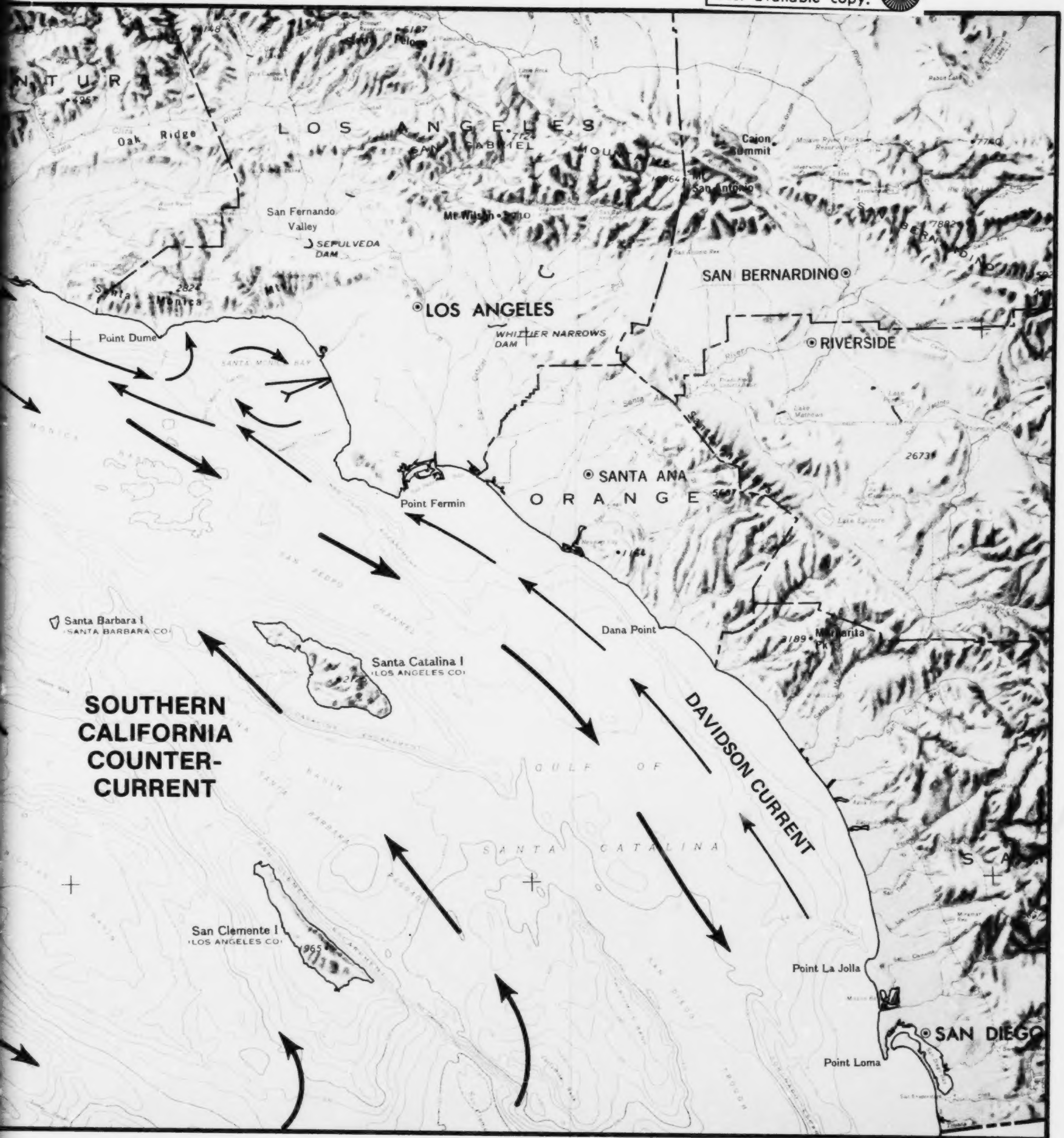
Oak Ridge
LOS ANGELES
SAN GABRIEL MOUNTAINS
Cajon Summit
Mt San Antonio
San Fernando Valley
SEPULVEDA DAM
Mt Wilson
Santa Monica Mts
SAN BERNARDINO
LOS ANGELES
WHITTIER NARROWS DAM
RIVERSIDE
Point Dume
SANTA MONICA BAY
SANTA ANA
ORANGE
Point Fermin
SAN PEDRO CHANNEL
Santa Barbara I
SANTA BARBARA CO
Santa Catalina I
LOS ANGELES CO
Dana Point
Margarita Pk
SOUTHERN CALIFORNIA COUNTER-CURRENT
DAVIDSON CURRENT
GULF OF SANTA CATALINA
San Clemente I
LOS ANGELES CO
Point La Jolla
SAN DIEGO
Point Loma

198P-226

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Table GS-4. Average concentrations of general constituents, trace metals, and chlorinated hydrocarbons, in the final effluent of municipal waste discharges for 1974 (SCCWRP, 1975a; DPW, 1975a).

CONSTITUENT	JWPCP (LA COUNTY)	HYPERION (LA CITY)		ORANGE[1] COUNTY (SAN DIEGO)	POINT LOMA	OXNARD	TERMINAL ISLAND (LA CITY)
		5-MILE	7-MILE				
Flow (mgd)	346	341	4.72	171	104	10.1	10.3
General Constituents (mg/l)							
Total Suspended Solids	276	83	7,300	107	138	168	151
Volatile Suspended Solids	182	66	4,700	75	106	---	---
5-day BOD	213	121	1,900[2]	150	190	251	159
Chemical Oxygen Demand	613	250	7,700[2]	---	---	---	342
Oil and Grease	55.1	18	900	34.8	41.1	39.2	22
Nitrate Nitrogen	0.15	0.3	---	---	---		0.3
Ammonia Nitrogen	38.5	13.8	300[2]	34.8	26.5	---	20.9
Organic Nitrogen	15.7	6.3	250[2]	---	---	---	9.4
Total Nitrogen	54.4	20.4	550[2]	---	38.0	---	30.6
Total Phosphate	47.5	24.3	663[2]	---	---	---	34.0
Detergent (MBAS)	6.85	5.1	---	---	7.96	1.25	9.2
Cyanide	0.43	0.2	0.53	---	0	0.005	0.11
Phenols	3.31	0.06	---	---	0.23	0.16	0.07
Trace Metals (mg/l)[3]							
Silver	0.012	0.02	0.40	0.012	0.008	0.008	0.02
Arsenic	0.025	0.01	0.18	---	<0.026	0.001	0.01
Cadmium	0.041	0.02	1.27	0.061	0.026	0.012	0.01
Chromium	0.86	0.21	15.1	0.28	0.11	0.020	0.20
Copper	0.60	0.19	13.9	0.40	0.10	0.074	---
Iron	8.17	0.64	78.7	---	6.40	1.00	0.88
Mercury	0.0011	0.0032	0.15	---	0.0005	---	0.0044
Manganese	0.11	0.02	0.19	---	0.40	0.10	0.03
Nickel	0.31	0.18	3.1	0.23	0.049	---	0.27
Lead	0.26	0.04	1.13	0.17	0.059	0.13	0.07
Selenium	0.012	0.02	0.40	---	---	0.014	0.19
Zinc	1.79	0.24	23.9	0.54	0.50	0.28	0.36
Chlorinated Hydrocarbons (μg/l)							
Total DDT	3.01	0.12[4]	2.59	---	2.32	<0.25	
Total PCB	10.8[5]	0.35[6]	122[6]	17.1	---	---	0.0013[7]
Dieldrin	0.01	0.01	0.17	---	---	<0.10	

[1] All Orange County values based on 10 months of data (no May-June data) except flow, cyanide, and total PCB, which are based on 6 months of data (July-December).

[2] Based upon analysis of 10 weekly composites.

[3] Point Loma trace metals based on less than 12 months: silver, 9 months; copper, 4 months; iron, 2 months; manganese, 5 months.

[4] Calculated from mass emission rate of Table III-B-3 (SCCWRP data). The HTP value was 0.72 μg/l.

[5] The average concentration for January to September was 4.72; for October to December, 29.1.

[6] These values were determined independently by SCCWRP (Young et al., 1975, page 5) and are similar to the HTP values for the 5-mile effluent but substantially higher (122 μg/l compared with 3.3 μg/l) for the 7-mile effluent. Young (personal communication, 23 June 1975) believes that his data are correct, and that HTP's data underestimated the actual concentrations.

[7] Total identifiable chlorinated hydrocarbons.

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Table GS-5. Mass emission rates of general constituents, trace metals, and chlorinated hydrocarbons in the final effluent of municipal waste discharges for 1974 (SCCWRP, 1975a; DPW, 1975a).

CONSTITUENT	JWPCP (LA COUNTY)	HYPERION (LA CITY)		ORANGE COUNTY	POINT LOMA (SAN DIEGO)	OXNARD	TERMINAL ISLAND (LA CITY)
		5-MILE	7-MILE				
Flow (mgd)	346	341	4.72	171	104	10.1	10.3
General Constituents (metric tons/yr)							
Total Suspended Solids	132,000	39,100	47,500	25,200	19,800	2,340	2,148
Volatile Suspended Solids	86,900	31,100	30,600	17,700	15,200	---	---
5-day BOD	102,000	56,900	12,400	35,400	27,300	3,500	2,263
Chemical Oxygen Demand	293,000	118,000	50,200	---	---	---	4,867
Oil and Grease	26,300	8,470	5,860	8,210	5,900	546	313
Nitrate Nitrogen	71.6	141	---	---	---	---	4.3
Ammonia Nitrogen	18,400	6,490	1,950	8,210	3,800	---	297
Organic Nitrogen	7,500	2,960	1,628	---	---	---	134
Total Nitrogen	26,000	9,600	3,580	9,300	5,450	---	436
Total Phosphate	22,700	11,400	4,320	---	---	---	484
Detergent (MBAS)	3,270	2,400	---	---	1,140	17.4	131
Cyanide	205	94.1	3.45	---	---	0.07	1.6
Phenols	1,580	28.2	---	---	33.0	2.23	1.0
Trace Metals (metric tons/yr)							
Silver	5.73	9.41	2.61	2.83	1.15	0.11	0.29
Arsenic	11.3	4.71	1.17	---	<3.73	0.014	0.14
Cadmium	19.6	9.41	8.27	14.4	3.73	0.17	0.14
Chromium	411	98.8	98.4	66.1	15.8	0.28	2.85
Copper	286	89.4	90.5	94.4	14.4	1.03	---
Iron	3,900	301	513	---	919	13.9	12.5
Mercury	0.53	1.51	0.98	---	0.07	---	0.06
Manganese	52.5	9.41	1.24	---	57.4	1.39	0.43
Nickel	148	84.7	20.2	54.3	7.03	---	3.84
Lead	124	18.8	7.36	40.1	8.47	1.81	1.0
Selenium	5.73	9.41	2.61	---	---	0.20	2.7
Zinc	855	113	156	127	71.8	3.90	5.1
Chlorinated Hydrocarbons (kg/yr)							
Total DDT	1,440	56[3]	17[3]	---	333	<3.48	
Total PCB	5,160[1]	160[3]	790[3]	4,040	---	---	0.019[2]
Dieldrin	4.77	4.71	1.11	---	---	<1.39	

[1] Two-thirds of this amount (3,470 kg) was discharged during the 3-month period, October to December.

[2] Total identifiable chlorinated hydrocarbons.

[3] These data are from an independent analysis of DDT and PCB in the Hyperion Effluent by SCCWRP (1975a, page 106). The mass emission rates of DDT calculated by HTP at the 5-mile outfall are 6 times those calculated by Young, et al., but are identical at the 7-mile outfall. The total PCB emission rates calculated by Young, et al. are similar to the HTP calculations at the 5-mile outfall, but are 37 times those calculated by HTP at the 7-mile outfall.

The sediments in the immediate vicinity of the 7-mile outfall have been altered substantially by the past sludge discharges. The presence of a sulfide smell, noted subjectively at the time of sampling, in the sludge sediments suggests that some areas of these sediments remain chemically reduced and anaerobic since sulfides are oxidized rapidly in the presence of oxygen. Volatile solids (an index of organic content) accumulate near the end of the 7-mile outfall as do sulfides, arsenic, cyanide, COD, and BOD (see Figures GS-22 and GS-23). Higher than background concentrations of heavy metals and chlorinated hydrocarbons also occurred in the vicinity of the 7-mile outfall (see Figures GS-24, GS-25, GS-26, and GS-27). Only phenols and chlorinated hydrocarbons showed a definite benthic distribution related to the 5-mile outfall. It has been estimated that as much as 40 percent of the volatile solids and 70 percent of the metals discharged in the sludge may still remain in the sediments surrounding the outfall, but definitive studies have yet to be made. Many other figures are given in the main text showing other pollutants in the sediments near the LA City discharge points.

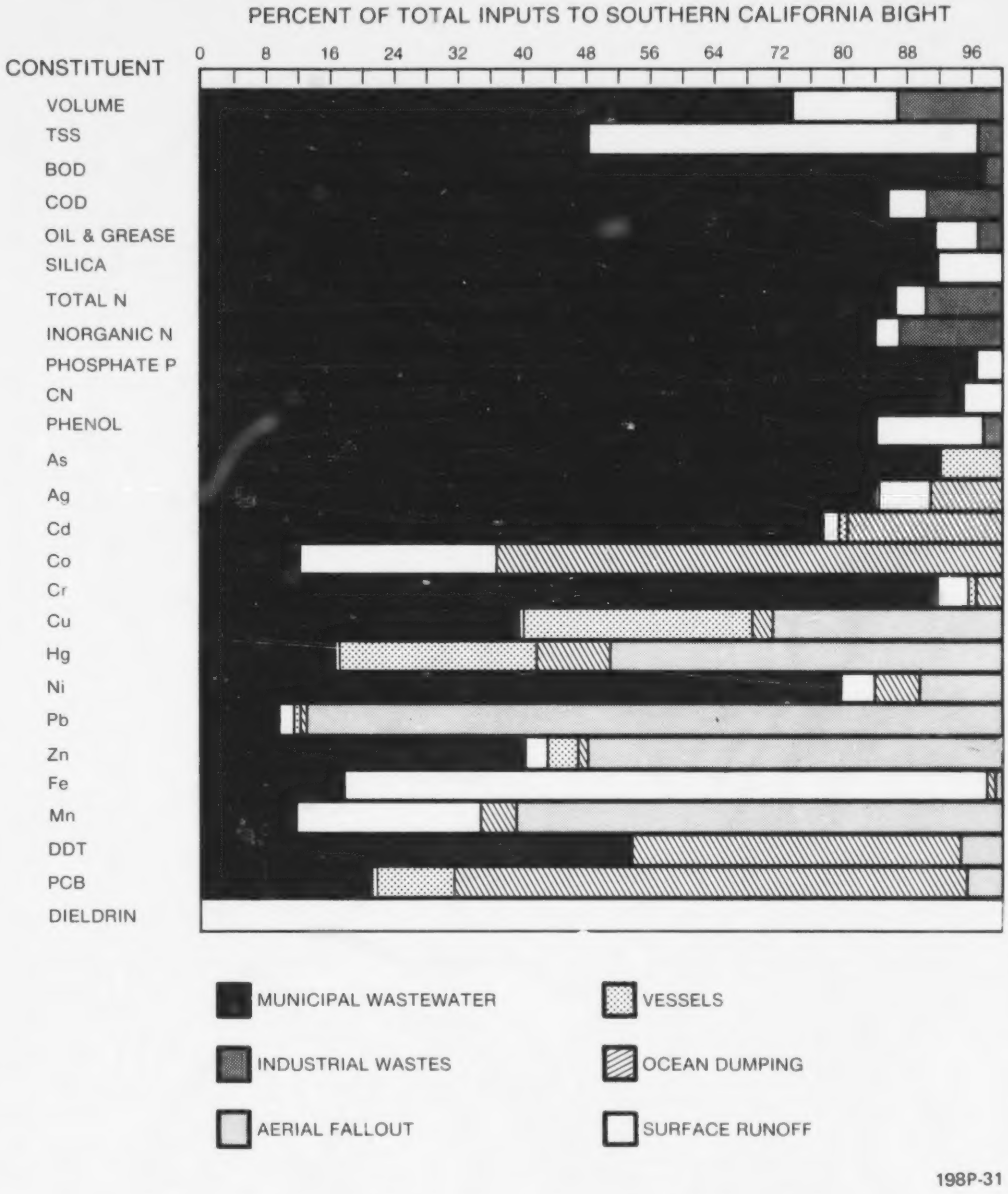
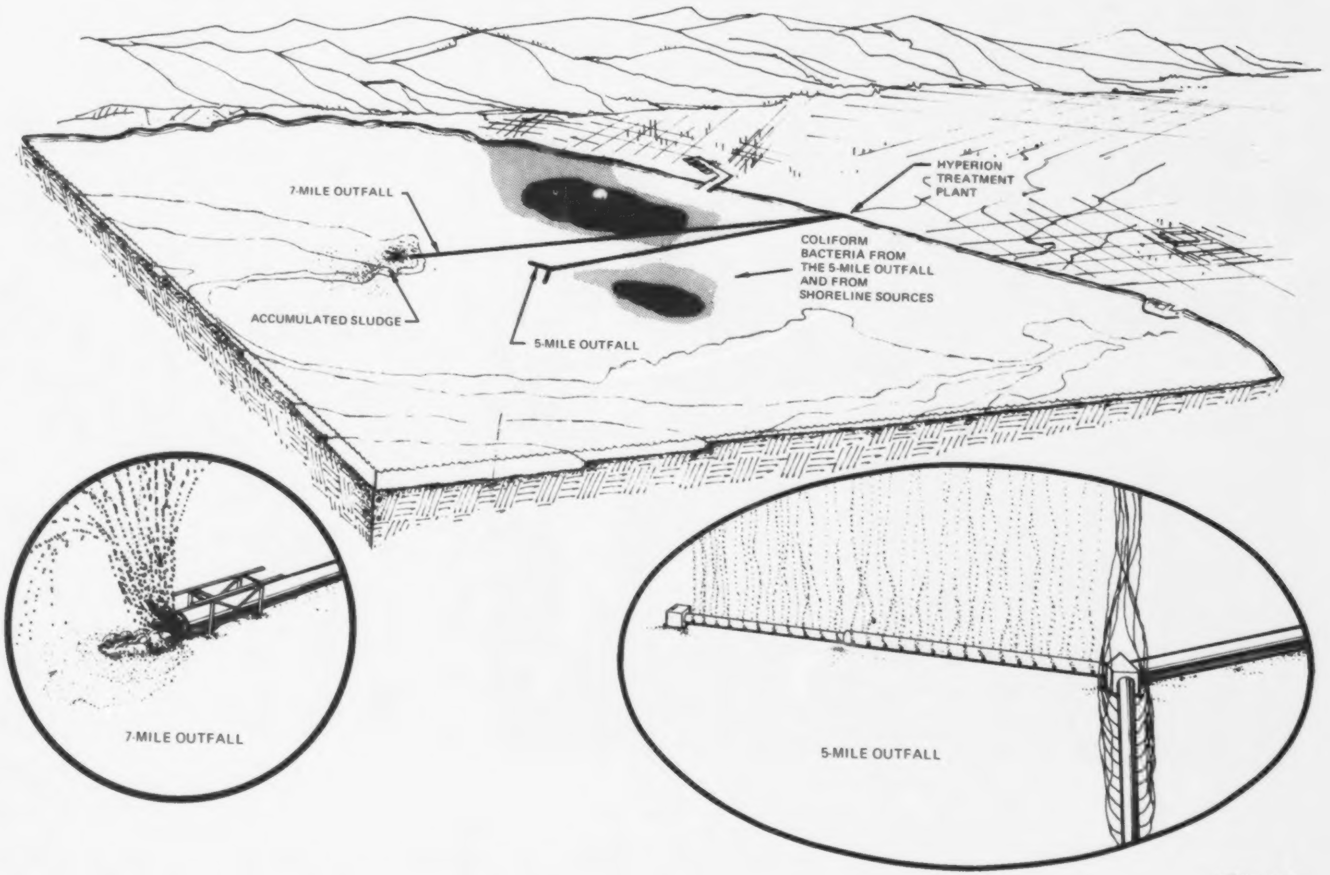


Figure GS-18. Average annual mass emission rates for pollutants from each of the major point and nonpoint sources to the Southern California Bight in 1971 (date from SCCWRP, 1973).


HYPERION TREATMENT PLANT
7-MILE OUTFALL
COLIFORM BACTERIA FROM THE 5-MILE OUTFALL AND FROM SHORELINE SOURCES
ACCUMULATED SLUDGE
5-MILE OUTFALL
7-MILE OUTFALL
5-MILE OUTFALL

198P-232

Figure GS-19. Hyperion Treatment Plant outfalls with an artist's representation of the sludge and wastewater discharges. The January 1974 surface coliform bacteria (from the HTP effluent and shoreline sources) are also shown.

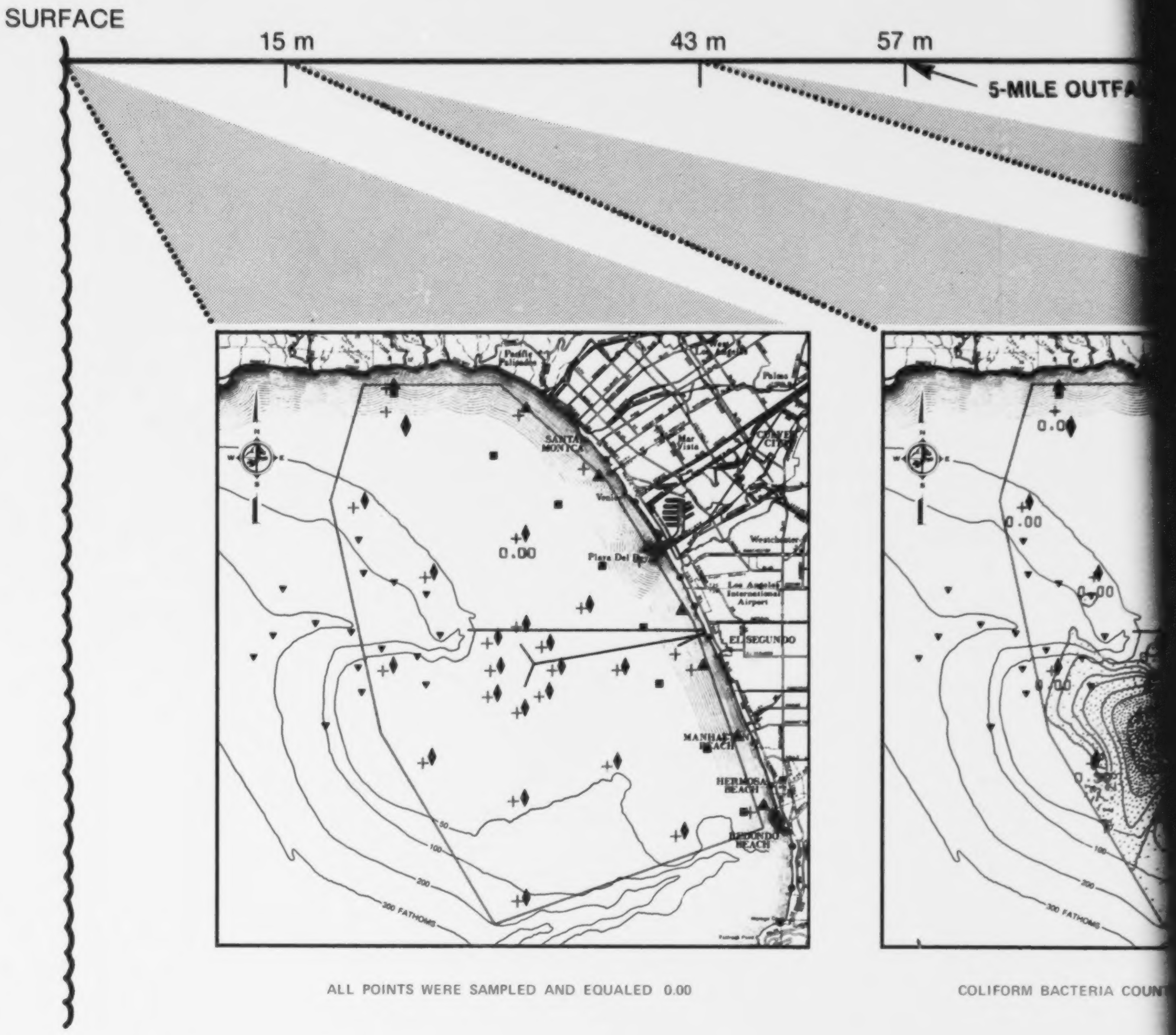
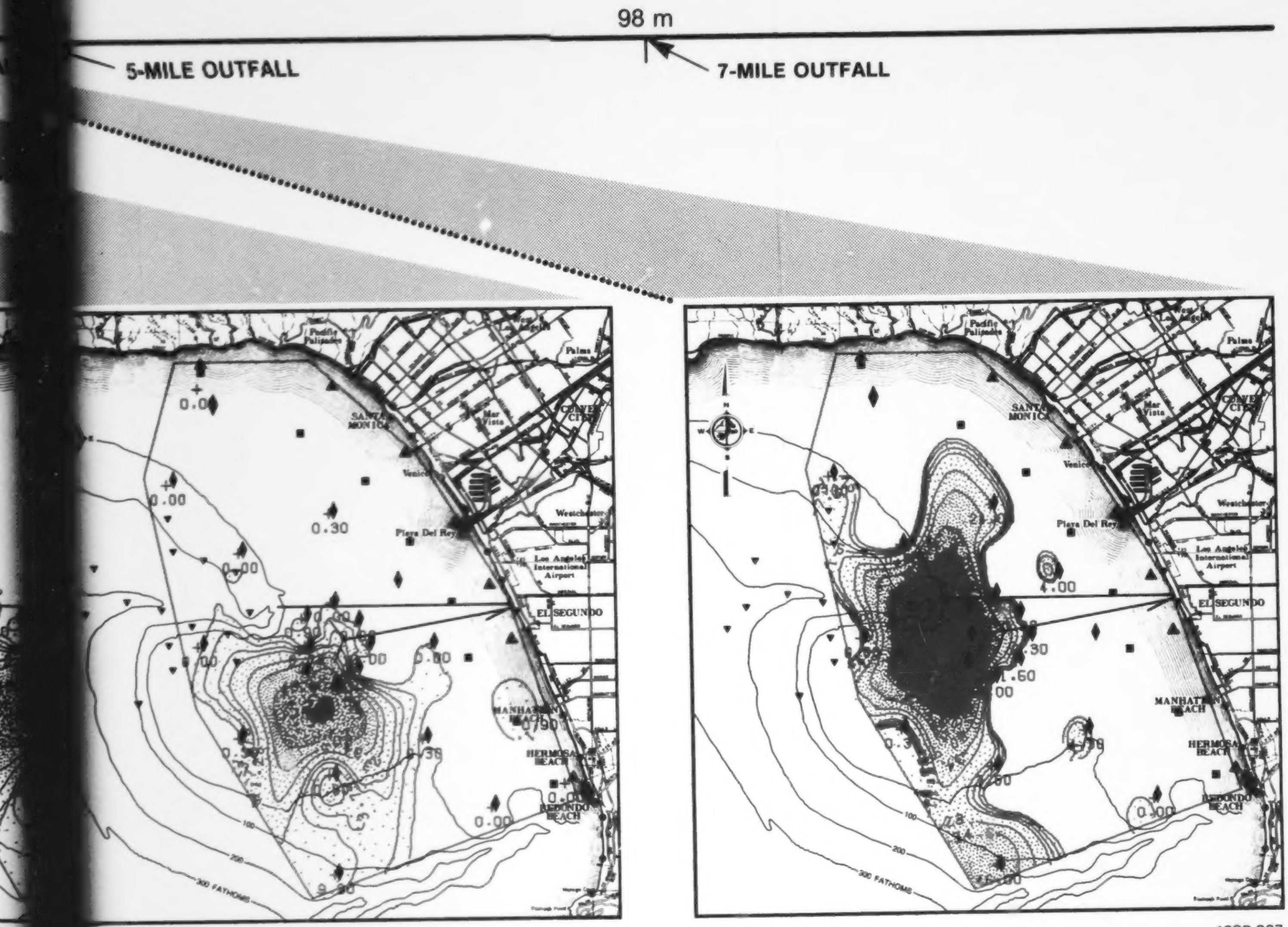

SURFACE
15 m
43 m
57 m
5-MILE OUTFA
Pacific Palisades
Santa Monica
Venice
Mar Vista
Culver City
Palms
Playa Del Rey
Westchester
Los Angeles International Airport
El Segundo
Manhattan Beach
Hermosa Beach
Redondo Beach
0.00
50
100
200
300 FATHOMS
ALL POINTS WERE SAMPLED AND EQUALED 0.00
COLIFORM BACTERIA COUN

Figure GS-20. Total coliform bacteria counts in MPN/ml measured in the surface waters and at depths of 50 and 140 feet in the vicinity of the HTP outfalls on 22 July 1974 (HTP, unpublished data). This figure shows that in the summer, coliform bacteria of sewage origin remain below the thermocline.

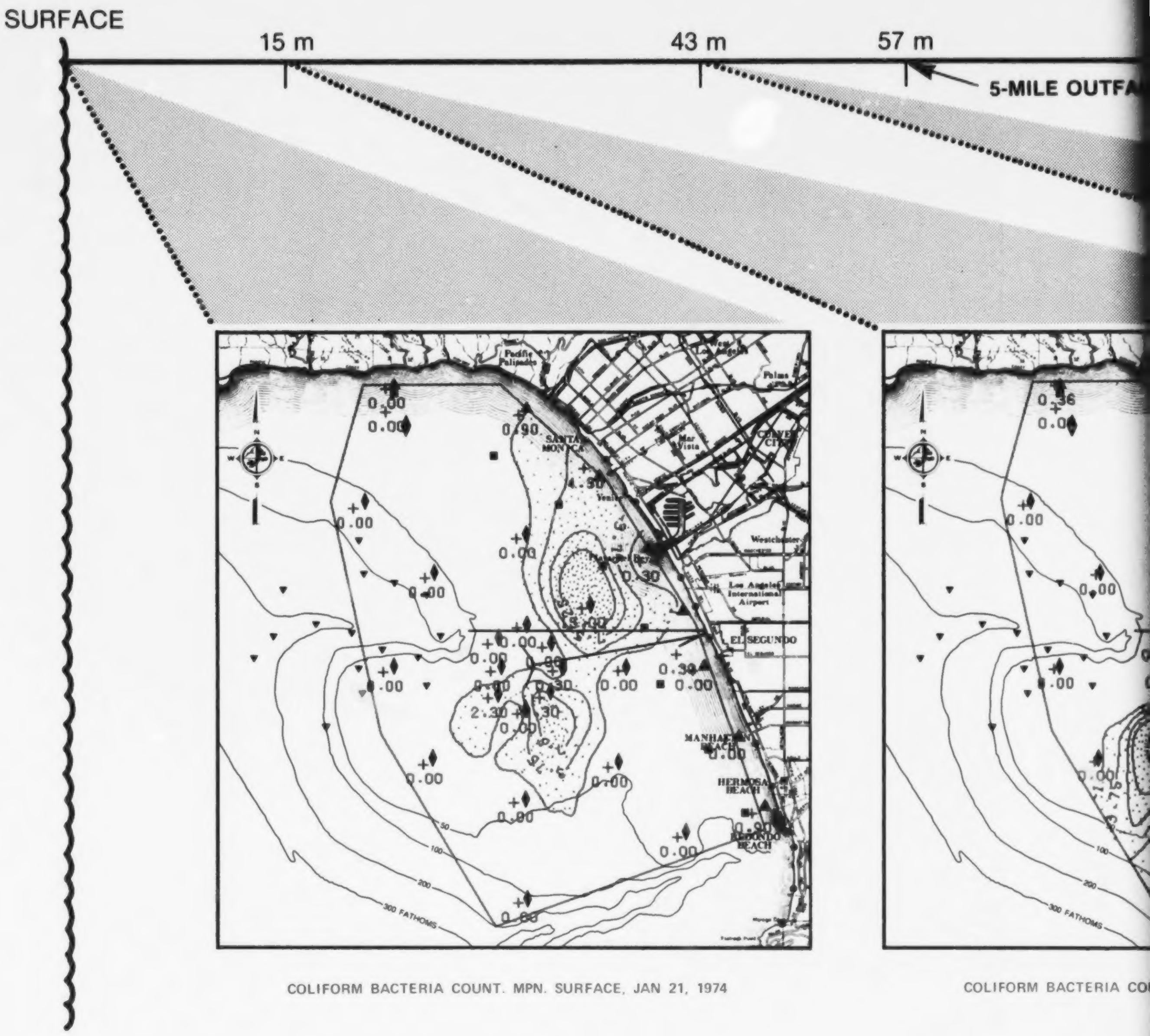

98 m
5-MILE OUTFALL
7-MILE OUTFALL
Pacific Palisades
Palms
SANTA MONICA
Mar Vista
CULVER CITY
Venice
Westchester
Playa Del Rey
Los Angeles International Airport
EL SEGUNDO
MANHATTAN BEACH
HERMOSA BEACH
REDONDO BEACH
100
200
300 FATHOMS
0.00
0.30
4.00
1.60

UNT

COLIFORM BACTERIA COUNT. MPN. 50 FEET, JUL 22, 1974

198P-237

COLIFORM BACTERIA COUNT. MPN. 140 FEET, JUL 22, 1974


SURFACE
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5-MILE OUTFA
Pacific Palisades
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Mar Vista
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Palms
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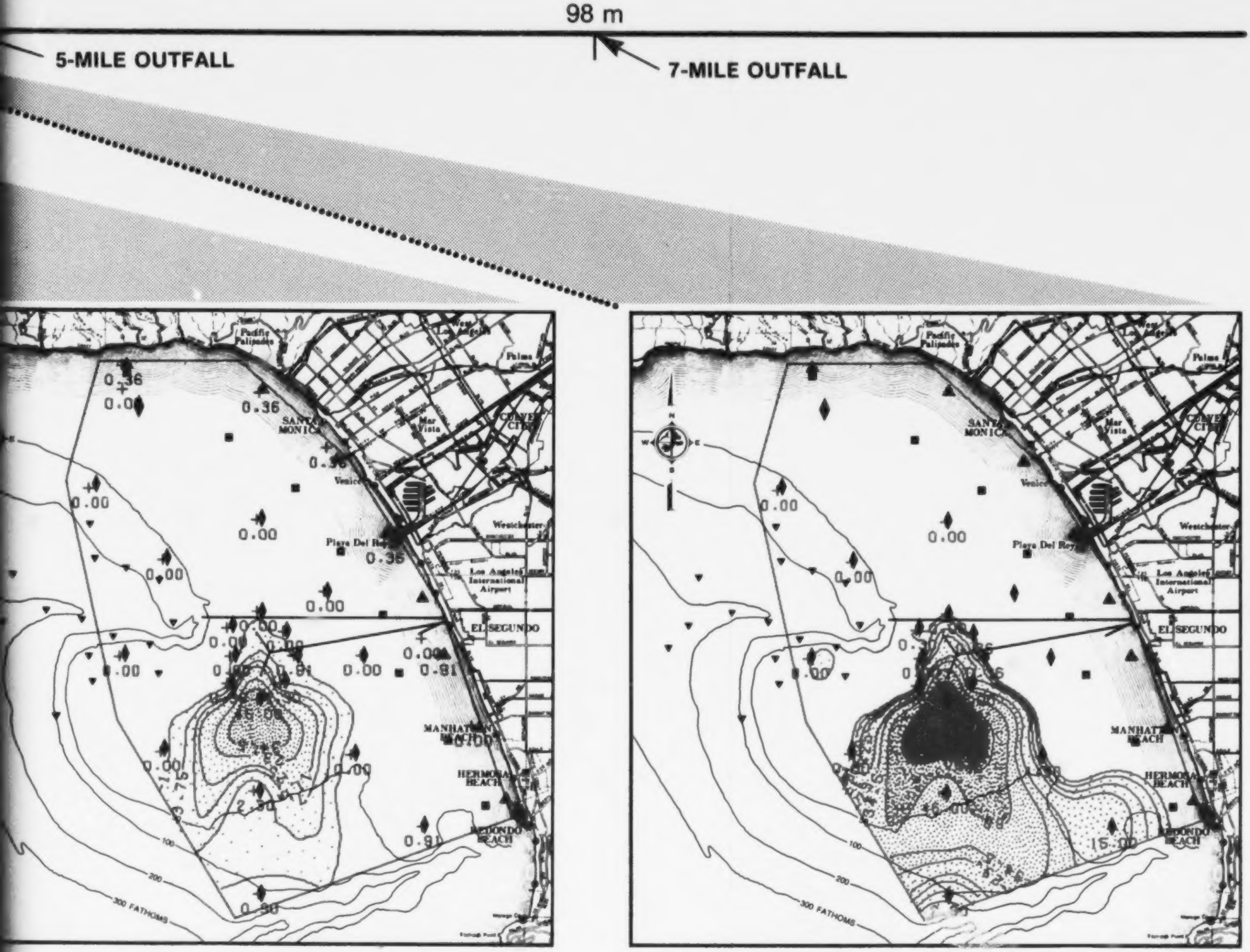
Los Angeles International Airport
EL SEGUNDO
MANHATTAN BEACH
HERMOSA BEACH
REDONDO BEACH
50
100
200
300 FATHOMS
0.00
0.90
4.50
0.30
8.00
2.30
0.36

COLIFORM BACTERIA COUNT. MPN. SURFACE, JAN 21, 1974

COLIFORM BACTERIA CO

Figure GS-21. Total coliform bacteria counts in MPN/ml measured in the surface waters and at depths of 50 and 140 feet in the vicinity of the HTP outfalls on 21 January 1974 (HTP, unpublished data). This figure shows that in winter total coliform bacteria, probably of outfall origin, are found in the surface waters near the outfalls. The surface total coliform concentrations near the shore in the vicinity of Playa del Rey probably resulted from storm runoff from Ballona Creek and other watercourses. Bacteria near shore at Hermosa Beach and Redondo Beach may also be of shoreline origin.


98 m
5-MILE OUTFALL
7-MILE OUTFALL
Pacific Palisades
Santa Monica
Mar Vista
Culver City
Venice
Playa Del Rey
Westchester
Los Angeles International Airport
El Segundo
Manhattan Beach
Hermosa Beach
Redondo Beach
100
200
300 FATHOMS
0.36
0.00
0.00
0.00
0.00
0.00
0.00
0.81
0.00
0.81
2.30
15.00

COLIFORM BACTERIA COUNT. MPN. 50 FEET, JAN 21, 1974

COLIFORM BACTERIA COUNT. MPN. 140 FEET, JAN 21, 1974

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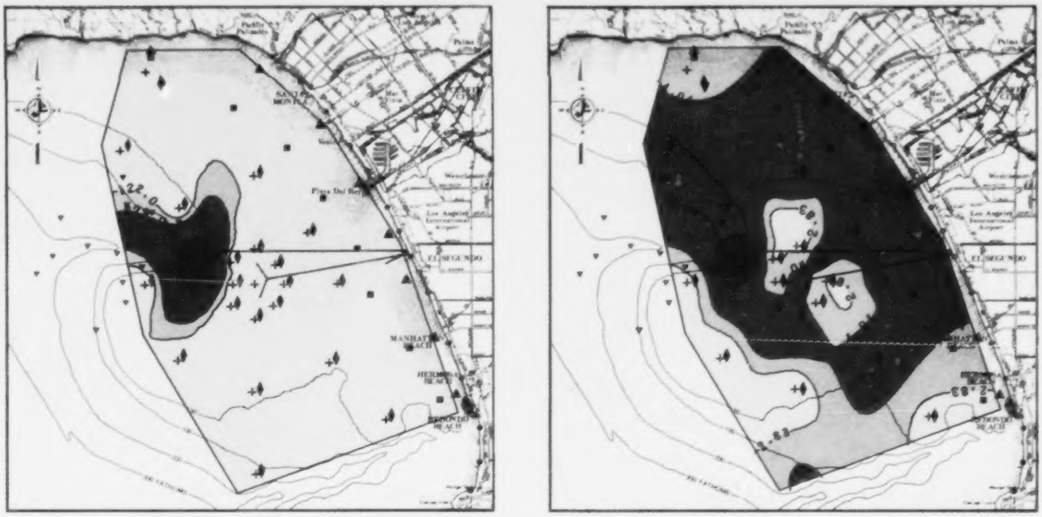
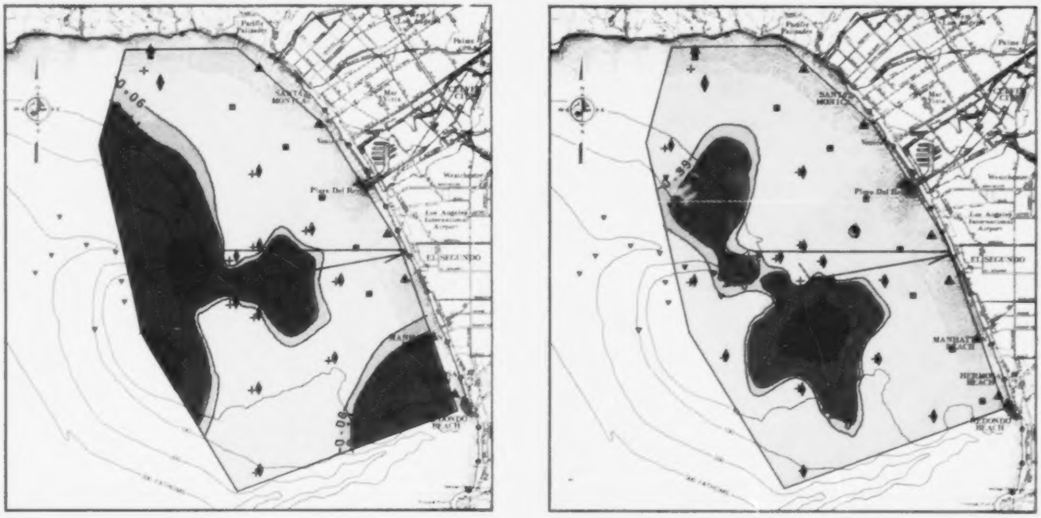

SANTA MONICA
Venice
Playa Del Rey
Westchester
Los Angeles International Airport
EL SEGUNDO
MANHATTAN BEACH
HERMOSA BEACH
REDONDO BEACH
Pacific Palisades

SULFIDES
HIGH = 2740 ppm
LOW = 1.7 ppm

ARSENIC
HIGH = 8.61 ppm
LOW = 0.53 ppm


SANTA MONICA
Playa Del Rey
Westchester
Los Angeles International Airport
EL SEGUNDO
MANHATTAN BEACH
HERMOSA BEACH
REDONDO BEACH
Pacific Palisades

CYANIDES
HIGH = 0.37 ppm
LOW = 0

PHENOLS
HIGH = 1.3 ppm
LOW = 0

198P-244

Figure GS-22. Concentrations in mg/dry kg of sulfides, arsenic, cyanide, and phenols in sediments in the vicinity of the HTP 7-mile outfall. Locations at which samples were taken are shown by a +. The isopleths are computer-drawn at the mean and 15 and 85 percentile concentrations for each data set, and intensity of color is indicative of concentration. The highest and lowest values from each data set are indicated on the figures. Except for phenols, the highest value was from the station at the end of the 7-mile outfall (data from DPW, 1973).

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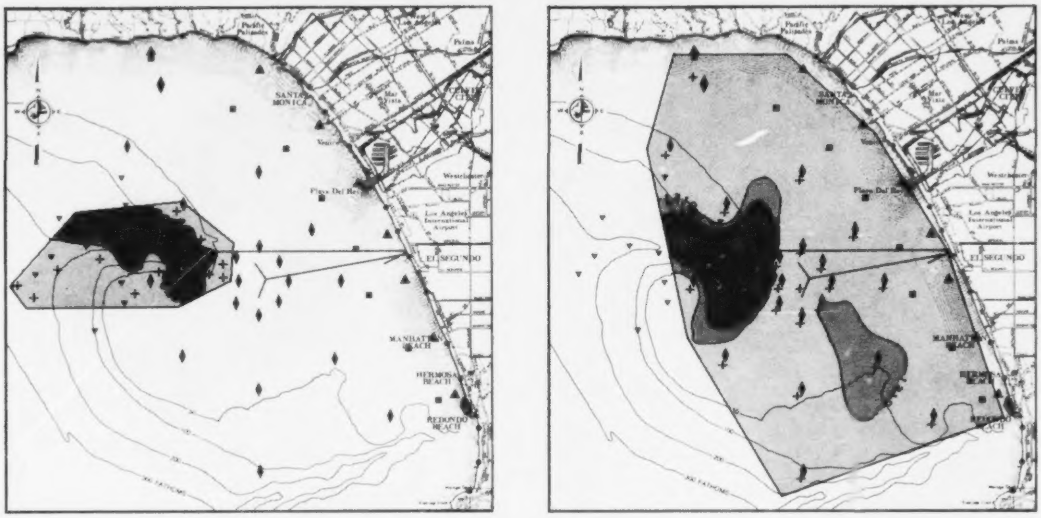
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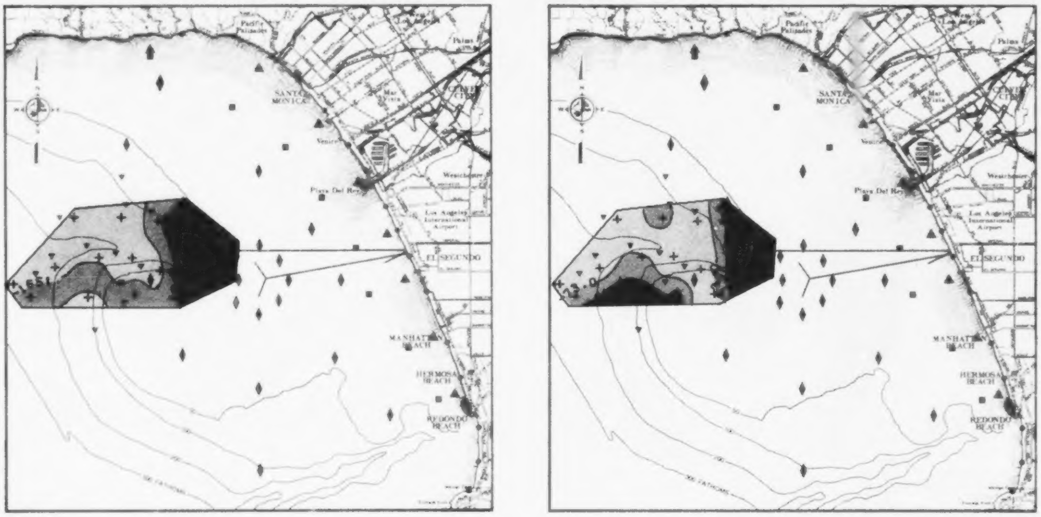
Playa Del Rey
Westchester
Los Angeles International Airport
El Segundo
Manhattan Beach
Hermosa Beach
Redondo Beach
300 FATHOMS

SCCWRP, unpublished data

COD, CORE
HIGH = 501.000
LOW = 14.394

SCCWRP, unpublished data

BOD, CORE
HIGH = 12.540
LOW = 357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El Segundo
Manhattan Beach
Hermosa Beach
Redondo Beach
300 FATHOMS

SCCWRP, unpublished data

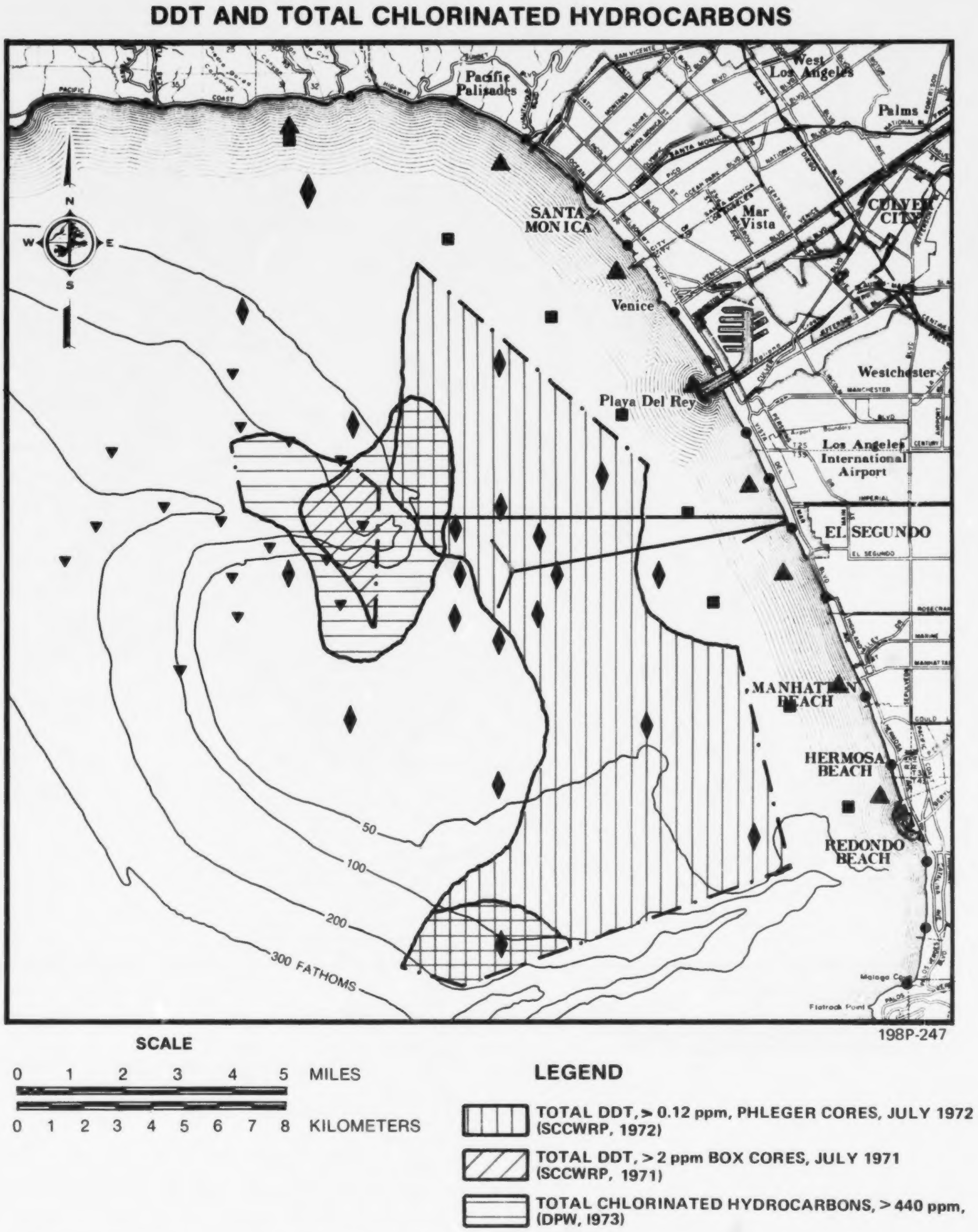
COD, SEDIMENT TRAP
HIGH = 676.000
LOW = 75.000

SCCWRP, unpublished data

BOD, SEDIMENT TRAP
HIGH = 38.800
LOW = 1.740

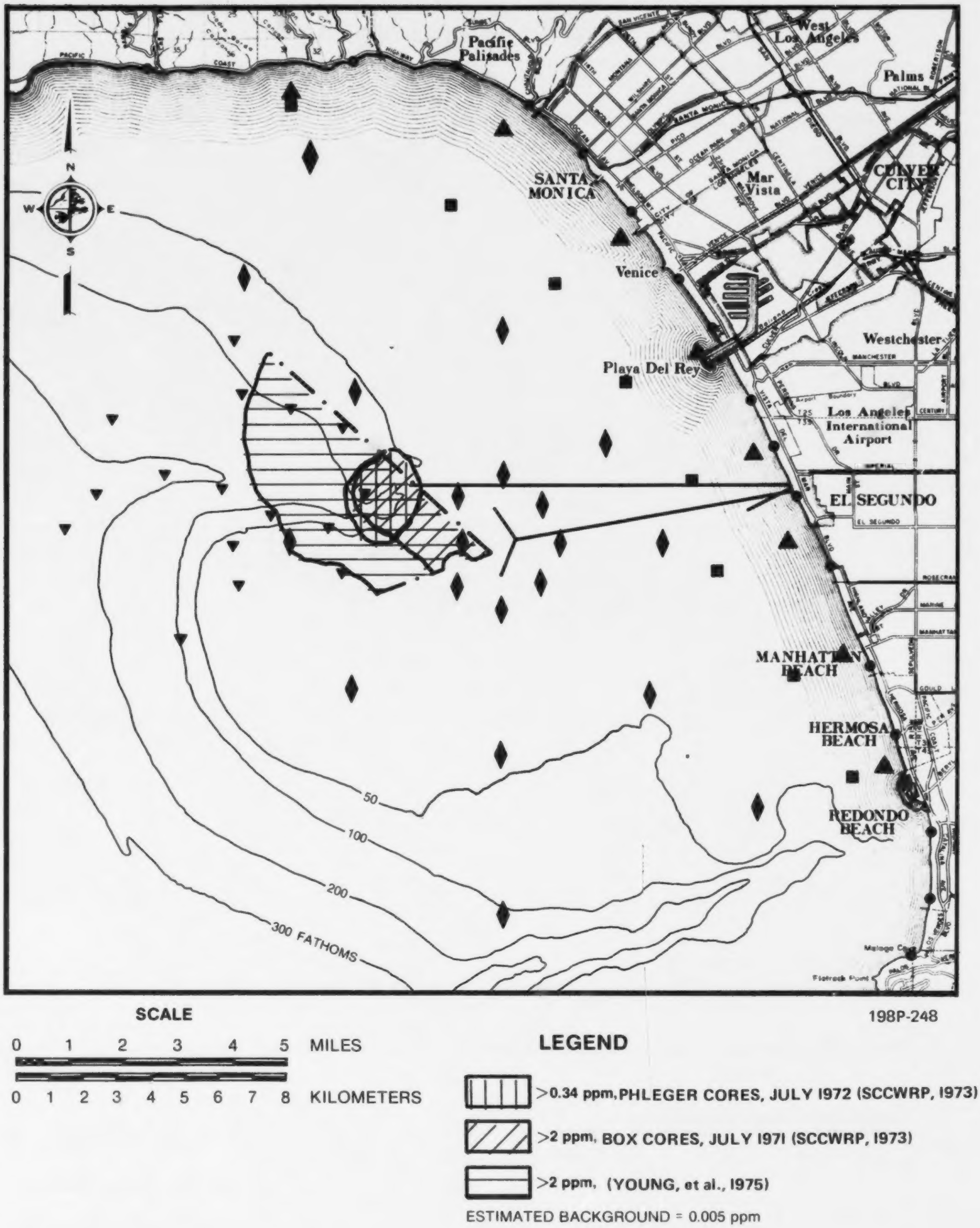
198P-245

Figure GS-23. Chemical and biochemical oxygen demand in mg/dry kg in the sediments in the vicinity of the HTP 7-mile outfall. Locations at which samples were taken are shown by a +. The isopleths are computer-drawn at the mean and 15 and 85 percentile concentrations for each data set, and intensity of color is indicative of concentration. The highest and lowest values from each data set are indicated on the figures. Except for COD, the highest value was from the station at the end of the 7-mile outfall (SCCWRP, unpublished data; DPW, 1973).



DDT AND TOTAL CHLORINATED HYDROCARBONS
Pacific Palisades
West Los Angeles
Palms
SANTA MONICA
Mar Vista
CULVER CITY
Venice
Westchester
Playa Del Rey
Los Angeles International Airport
EL SEGUNDO
MANHATTAN BEACH
HERMOSA BEACH
REDONDO BEACH
Malaga Cove
Flatrock Point
N
E
S
W
50
100
200
300 FATHOMS
198P-247
SCALE
0 1 2 3 4 5 MILES
0 1 2 3 4 5 6 7 8 KILOMETERS
LEGEND
TOTAL DDT, > 0.12 ppm, PHLEGER CORES, JULY 1972 (SCCWRP, 1972)
TOTAL DDT, > 2 ppm BOX CORES, JULY 1971 (SCCWRP, 1971)
TOTAL CHLORINATED HYDROCARBONS, > 440 ppm, (DPW, 1973)

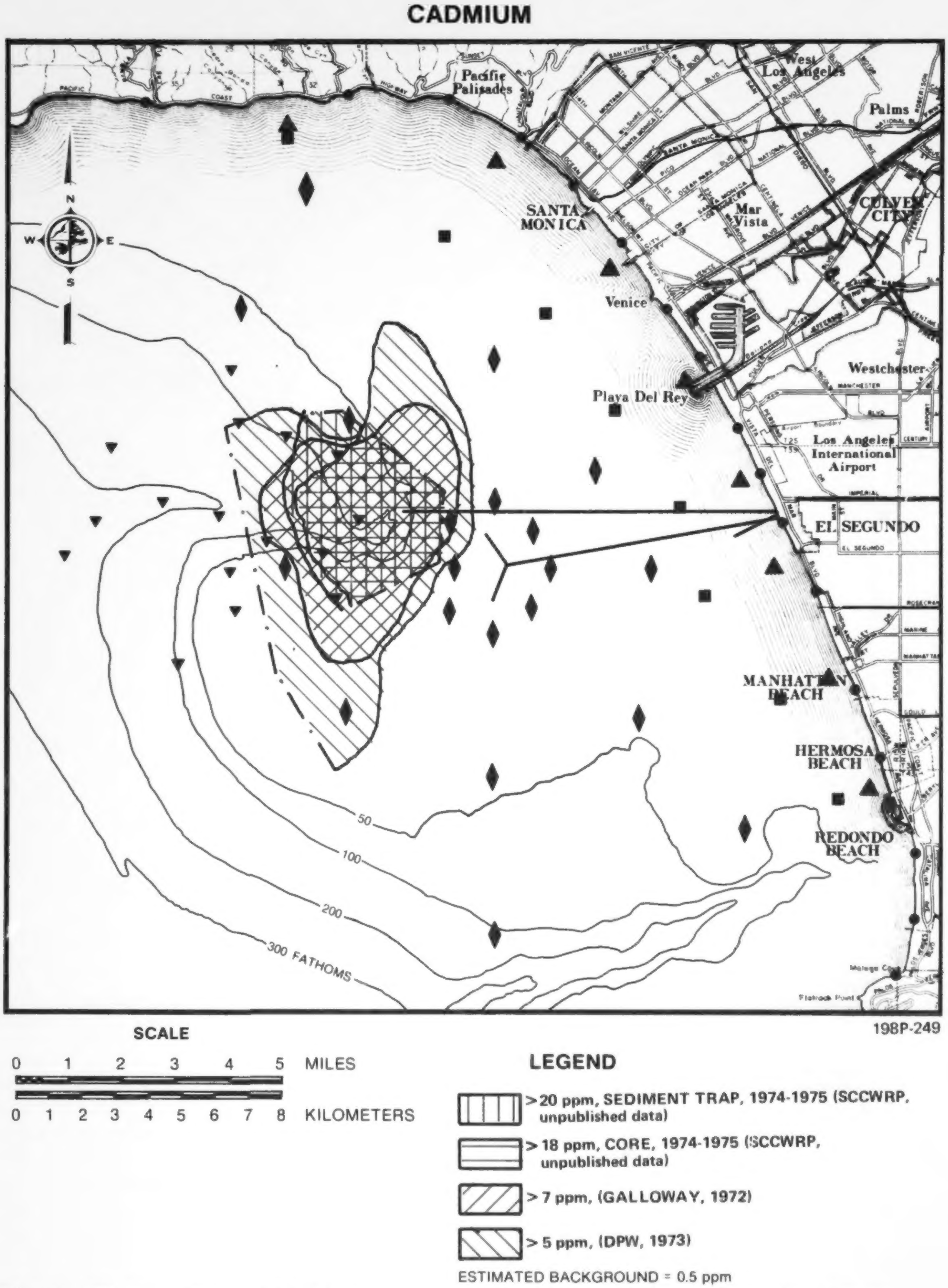
Figure GS-24. The solid lines are computer-drawn isoconcentration (in mg/dry kg) lines in the sediments in the vicinity of the HTP outfalls. The broken lines indicate a constraint imposed on the area included within the isopleths to keep the computer from extrapolating more than 1 or 2 km away from the nearest data point. The complete tabulated data and isopleth plots from which this figure was condensed are included in Appendix III-A (data from SCCWRP, 1973; DPW, 1973).



POLYCHLORINATED BIPHENYLS (PCB's)

Pacific Palisades
West Los Angeles
Palms
SANTA MONICA
Mar Vista
CULVER CITY
Venice
Westchester
Playa Del Rey
Los Angeles International Airport
EL SEGUNDO
MANHATTAN BEACH
HERMOSA BEACH
REDONDO BEACH
Malaga Cove
Flatrock Point
N
S
E
W
50
100
200
300 FATHOMS
198P-248
SCALE
0 1 2 3 4 5 MILES
0 1 2 3 4 5 6 7 8 KILOMETERS
LEGEND
>0.34 ppm, PHLEGER CORES, JULY 1972 (SCCWRP, 1973)
>2 ppm, BOX CORES, JULY 1971 (SCCWRP, 1973)
>2 ppm, (YOUNG, et al., 1975)
ESTIMATED BACKGROUND = 0.005 ppm

Figure GS-25. The solid lines are computer-drawn isoconcentration lines in the sediments in the vicinity of the HTP outfalls. The broken lines indicate a constraint imposed on the area included within the isopleths to keep the computer from extrapolating more than 1 or 2 km away from the nearest data point. The complete tabulated data and isopleth plot from which this figure was condensed are included in Appendix III-A (data from SCCWRP, 1973; Young et al., 1975).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Pacific Palisades
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SANTA MONICA
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Los Angeles International Airport
EL SEGUNDO
MANHATTAN BEACH
HERMOSA BEACH
REDONDO BEACH
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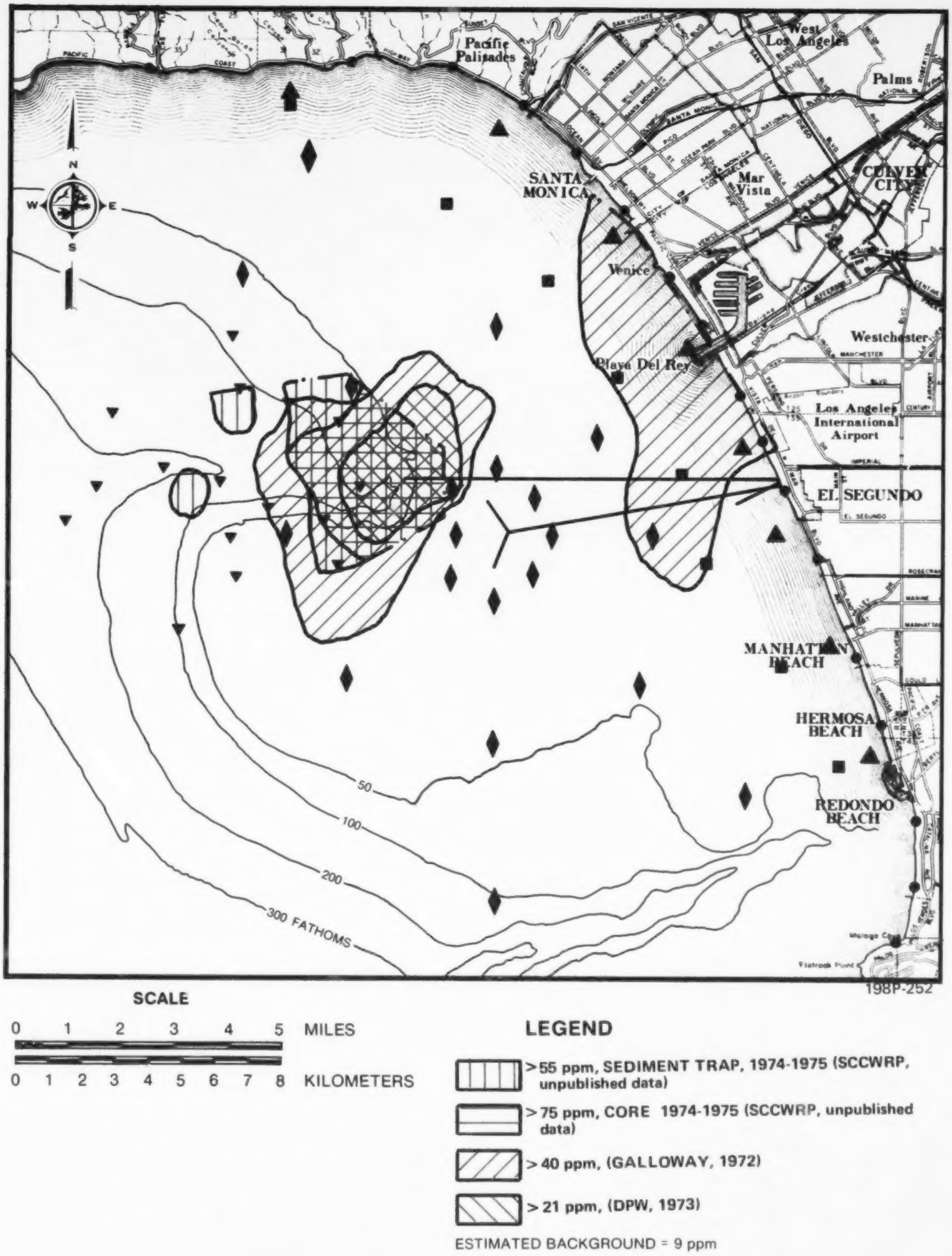
W
50
100
200
300 FATHOMS
198P-249
SCALE
0 1 2 3 4 5 MILES
0 1 2 3 4 5 6 7 8 KILOMETERS
LEGEND
>20 ppm, SEDIMENT TRAP, 1974-1975 (SCCWRP, unpublished data)
> 18 ppm, CORE, 1974-1975 (SCCWRP, unpublished data)
> 7 ppm, (GALLOWAY, 1972)
> 5 ppm, (DPW, 1973)
ESTIMATED BACKGROUND = 0.5 ppm

Figure GS-26. The solid lines are computer-drawn isoconcentration lines in the sediments in the vicinity of the HTP outfalls. The broken lines indicate a constraint imposed on the area included within the isopleths to keep the computer from extrapolating more than 1 or 2 km away from the nearest data point. The complete tabulated data and isopleth plot from which this figure was condensed are included in Appendix III-A (data from DPW, 1973; Galloway, 1972; SCCWRP, unpublished).

LEAD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HERMOSA BEACH
REDONDO BEACH
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50
100
200
300 FATHOMS
198P-252
SCALE
0 1 2 3 4 5 MILES
0 1 2 3 4 5 6 7 8 KILOMETERS
LEGEND
>55 ppm, SEDIMENT TRAP, 1974-1975 (SCCWRP, unpublished data)
>75 ppm, CORE 1974-1975 (SCCWRP, unpublished data)
>40 ppm, (GALLOWAY, 1972)
>21 ppm, (DPW, 1973)
ESTIMATED BACKGROUND = 9 ppm

Figure GS-27. The solid lines are computer-drawn isoconcentration lines in the sediments in the vicinity of the HTP outfalls. The broken lines indicate a constraint imposed on the area included within the isopleths to keep the computer from extrapolating more than 1 or 2 km away from the nearest data point. The complete tabulated data and isopleth plot from which this figure was condensed are included in Appendix III-A (data from DPW, 1973; Galloway, 1972; SCCWRP, unpublished).

c. Potential Causes of Adverse Impacts.

(1) METALS—UPTAKE IN MARINE LIFE. There is considerable evidence that metals are accumulated by benthic fauna from water, sediments, and food organisms. Benthos in general (Klemmer et al., 1973), and specifically the red abalone (Anderlini, 1974), concentrate high levels of mercury, especially between Long Beach and La Jolla where the pollution input is high. Similarly, the bay mussel (*Mytilus edulis*)(Schulz-Baldes, 1973), and the common barnacle, *Balanus balanoides,* (Ireland, 1974), concentrate lead from water containing elevated metal levels. Crabs had the highest arsenic concentrations of any benthic invertebrates collected from the Pacific coast of Canada, accumulating tissue levels as high as 37.8 mg/kg (wet weight)(LeBlanc et al., 1973). The mussels, *Mytilus galloprovincialis,* concentrated cadmium 160 times over ambient water levels and retained the accumulated metal for a relatively long time after ambient levels were greatly reduced (Fowler and Benayoun, 1974). When the dog whelk was transferred from clean to polluted water habitats, accumulation of cadmium, cobalt, and zinc resulted in equivalent body concentrations in the new residents and in the native molluscs within 2 to 4 months (Stenner and Nickless, 1974).

Figure GS-28 shows examples of metal uptake in benthic organisms in the vicinity of the LA City outfalls. More examples are in the main text.

Fish and mammals can also concentrate metals. The California sea lion concentrates lead in the hard tissues (bone and teeth) more than in soft tissues (muscle and fat) as had been reported for humans (Braham, 1973). Dry weight concentrations were 8.7 to 34.2 ppm in hard tissues and 0.3 to 3.8 ppm in soft tissues.

Very little is known about the effects of metals on marine mammals; however, mercury, selenium, cadmium, and bromine apparently play some role in premature births of California sea lions (Martin et al., 1976).

The process by which organisms concentrate toxicants from the environment into their body tissues is known as bioaccumulation. These substances may then be concentrated further as they pass through the food web in a process known as biomagnification. The magnitude of the concentration effect depends on such factors as the species involved (including their physiology and behavior), the chemical form of the toxicant, and other environmental factors (temperature, DO, presence of other toxicants, etc.). As the lower life forms in the ocean are consumed by higher order organisms, the concentration of metals and other pollutants in their bodies can increase. This "magnification of pollutants" through the food chain can have an impact on organisms far removed from the scene of the actual pollution, including man.

Figure GS-29 shows the concentrations of heavy metals in fish collected near the 5-mile outfall. Table GS-6 gives examples of metal concentrations in Pacific Ocean fish compared with those off Southern California.

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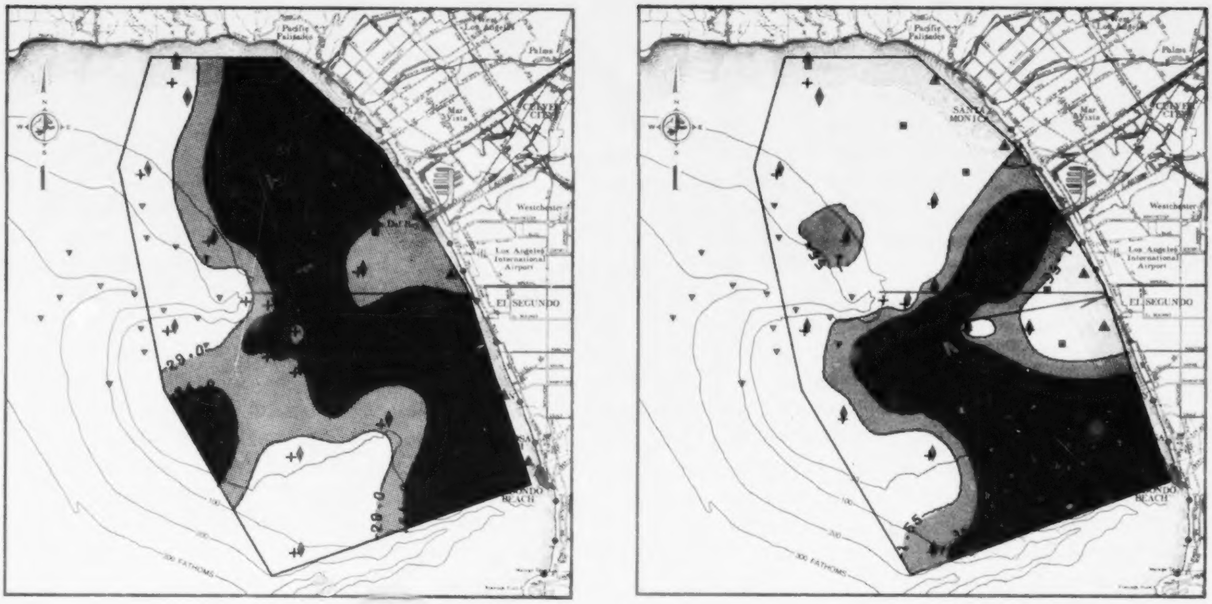
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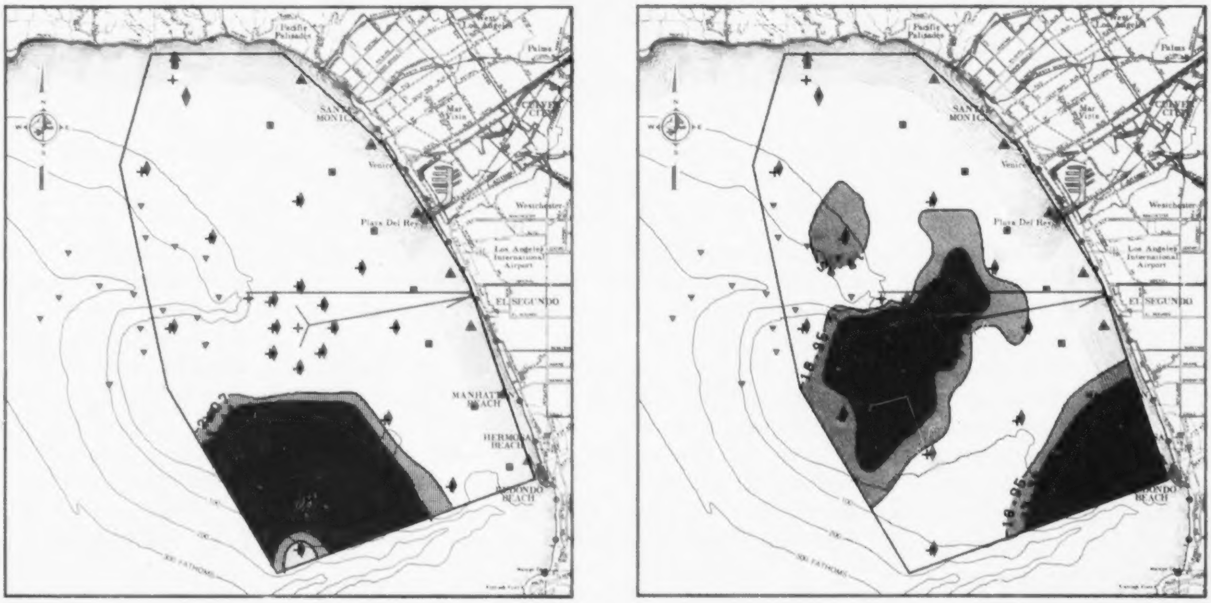
TISSUE ZINC

TISSUE CHROMIUM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18.95
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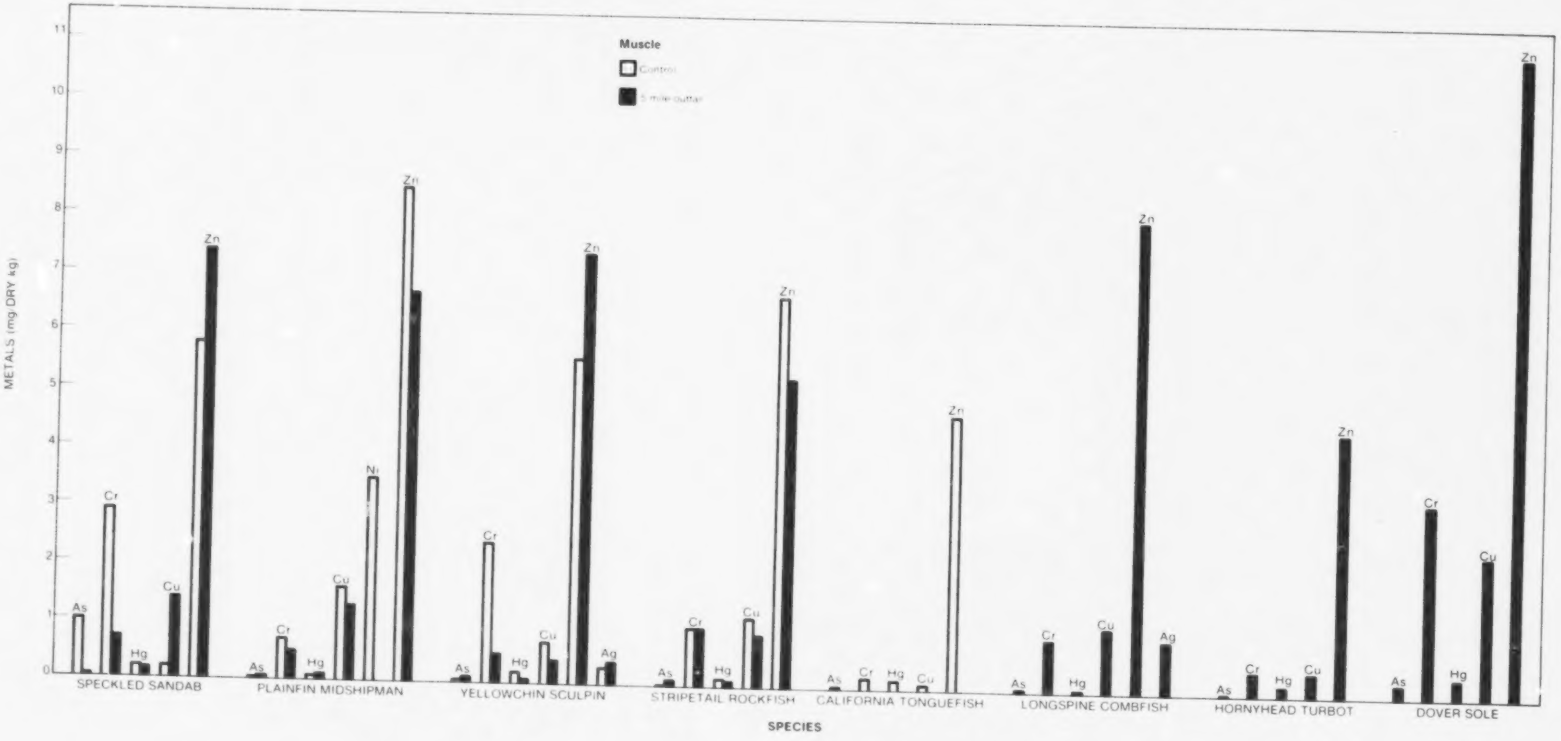
Figure GS-28. Concentrations of zinc, chromium, arsenic, and copper in mg/dry kg in the tissues of benthic organisms collected near the HTP outfalls in 1972 (data from DPW, 1973).



198P-302

Figure GS-29. Concentration (mg/dry kg) of heavy metals in the muscle tissue of fish collected near the HTP 5-mile outfall and at a control area located at the same depth, 9.7 km northwest of the outfall station, on 1 November 1972 (data from DPW, 1973).

Table GS-6. Trace metal concentrations in liver tissues of Atlantic and Pacific Ocean finfish and Southern California Dover sole (SCCWRP, 1973).

FISH	CONCENTRATIONS (mg/wet kg)											
	Ag	As	Cd	Co	Cr	Cu	Fe	Hg	Mo	Sb	Se	Zn
False Albacore[1]	-	0.9	0.6	-	-	0.9	-	0.3	-	-	-	50
Spanish Mackerel[1]	-	0.7	0.1	-	-	0.8	-	0.1	-	-	-	8
Unidentified Grouper[1]	-	0.5	0.8	-	-	9	-	1.1	-	-	-	25
Salmon[2]												
Chum	1.0	-	-	0.02	< 0.005-0.14	-	150	0.1	-	< 0.0003	5	25
Coho	0.06	-	-	0.04	< 0.005	-	110	0.1	-	0.0004	1	25
King	0.08	-	-	0.01	< 0.005-0.12	-	100	0.1	-	0.0004	1	30
Pink	0.25	-	-	0.01	< 0.005-0.01	-	100	0.1	-	0.006	1	40
Sockeye	1.5	-	-	0.01	< 0.005-0.12	-	80	0.1	-	0.006	10	25
Skipjack Tuna[3]	-	-	-	-	-	-	-	0.2	-	-	-	-
Sea Bass[3]	-	-	-	-	-	-	-	0.7	-	-	3	60
Albacore[3]	-	-	-	-	-	-	-	0.2-0.9	-	-	8-19	33-52
Calico Bass[4]	0.005	-	6	0.5	0.38	1.5	180	-	0.1	-	-	30
Dover Sole (Bight Avg.)	4.2	1.6	0.32	0.04	(~0.05)	2.6	190	0.14	0.09	0.0026	0.83	27

[1] From Windom (1972). Wet-weight values obtained from original dry-weight values assuming a wet/dry ratio of 4.0.

[2] From Robertson et al., (1972). Wet-weight values obtained from original dry-weight values using the wet/dry ratio of 4.2 listed by the authors for Chum Salmon liver.

[3] From Kinshore and Guinn (1972).

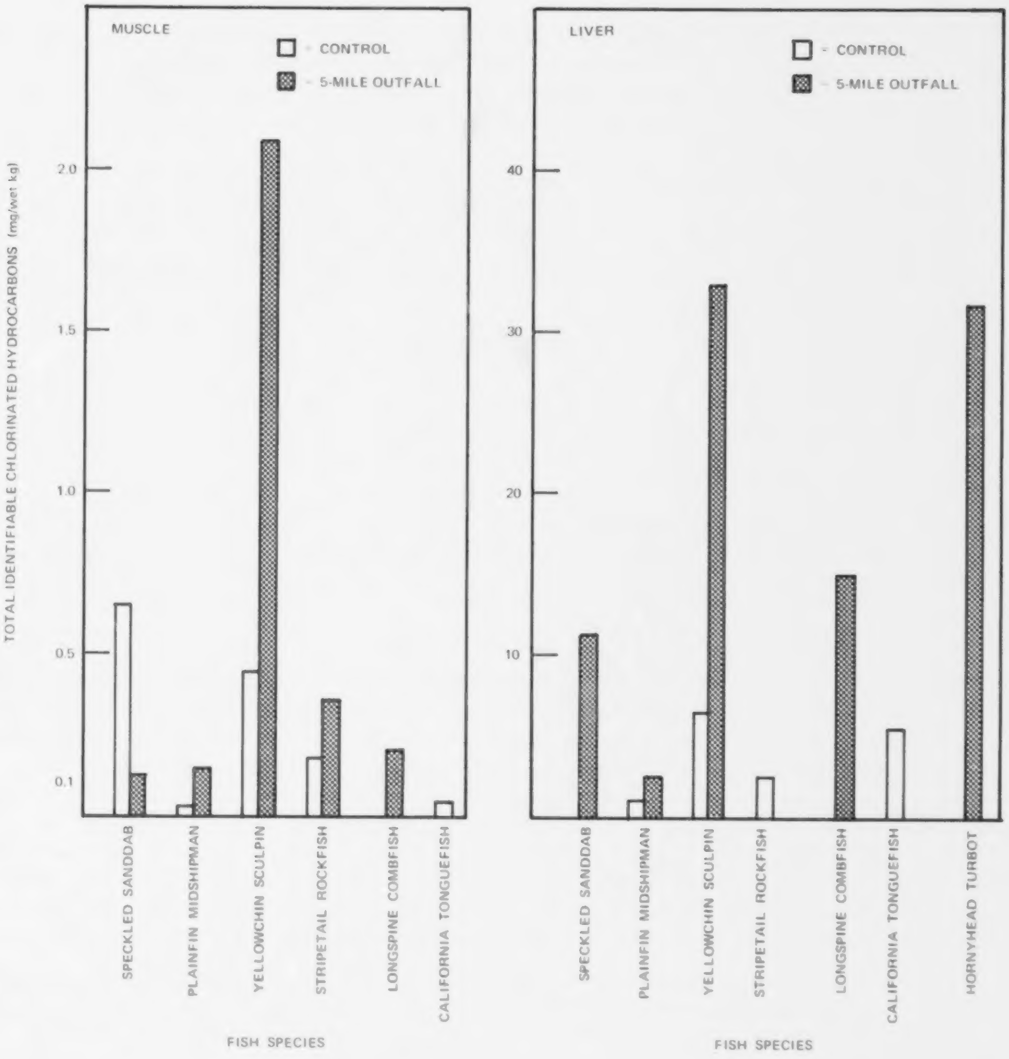
[4] From Stapleton (1968). Wet-weight values obtained from original dry-weight values assuming a wet/dry ratio of 4.0.

(2) SYNTHETIC ORGANIC CHEMICALS—UPTAKE IN MARINE LIFE. Studies conducted along the coast of Southern California have shown that some chlorinated hydrocarbons occur in significantly higher concentrations in the tissues (particularly the liver) of fish collected near wastewater outfalls than in other areas. Several species of fish collected along the Palos Verdes peninsula have exceeded the FDA standard of 5 ppm (mg/wet kg) DDT in edible tissue. At the HTP 5-mile outfall, yellowchin sculpin had greatly elevated TICH in muscle and liver tissues compared to the same species at a control site (Figure GS-30). Data for other species collected in the same study were inconclusive. Data presently available emphasize the potential effects of chlorinated hydrocarbons although current interest considers PAE and phosphate pesticides as potential contributors as well.

PCB concentrations in Dover sole from discharge and nondischarge areas are shown in Table GS-7.

Synthetic organics (especially the chlorinated hydrocarbons) also accumulated in benthic organisms. Figures GS-31 and GS-32 show PCB and DDT uptake in mussels near the sludge outfall.

(3) NUTRIENTS. The effluent from HTP contains nutrients (inorganic nitrogen in the form of ammonia, nitrates, and nitrites and inorganic phosphate) which are required and used by phytoplankton. Thus, if these



198P-301

Figure GS-30. Concentrations of TICH in the muscle and liver tissues of fish species collected near the HTP 5-mile outfall and at a control station located 9.7 km northwest of the outfall station in 1972. Absolute values are much higher in the liver than in the muscle, and there are differences between species. Only one fish of each species was sampled so that the data cannot be interpreted as reflecting real differences between species (data from DPW, 1973).

Table GS-7. Mean PCB concentrations in Dover sole muscle tissue from wastewater outfall and nonoutfall areas in 1971-1972 and 1974-1975 (from McDermott et al., 1975).

LOCATION	MEAN CONCENTRATION (mg/WET kg)	
	1971-1972	1974-1975
Port Hueneme	0.098	0.060
Santa Monica[1]	1.6	1.9
Palos Verdes[1]	2.4	1.4
Orange County[1]	0.63	1.2
Dana Point	0.13	0.25
Santa Catalina Island	0.039	0.081

[1] Wastewater outfall areas.

substances are introduced into the euphotic zone where phytoplankton live, the growth and productivity of phytoplankton will be enhanced up to the point that other substances, either in the effluent or occurring naturally in the seawater, become limiting (Dunstan, 1975). Phytoplankton (and other marine plants), because of their ability to utilize the energy in sunlight to construct large organic molecules, produce most of the naturally occurring food in the sea. They, therefore, constitute the food base which is the source of energy for other marine life including commercially and recreationally harvested species. Any inputs into the ocean which enhance their productivity potentially enhance the fishery (see Figure GS-33).

The effluent from HTP also contains organic compounds. These compounds are primarily made up of carbon and hydrogen (hydrocarbons) and some contain nitrogen. The vast majority of the organic compounds released by HTP are essentially nontoxic and may be utilized as food by marine organisms. They consist of the partially degraded bodies of microorganisms utilized in the sewage treatment process and the partially degraded organic materials introduced into the sewer system (including household garbage and human excretions). These substances can be utilized directly as food by zooplankton and filter-feeding invertebrates in the sea, and in this way, constitute a food base separate from that of the phytoplankton. To the extent that the energy and elements from them pass into harvested organisms, they too enhance the fishery.

Some of the organic compounds containing nitrogen, particularly amino acids which when linked together form proteins, are absorbed or ingested directly by marine organisms other than phytoplankton and form a nitrogen source to the marine food web separate from the inorganic nitrogen captured

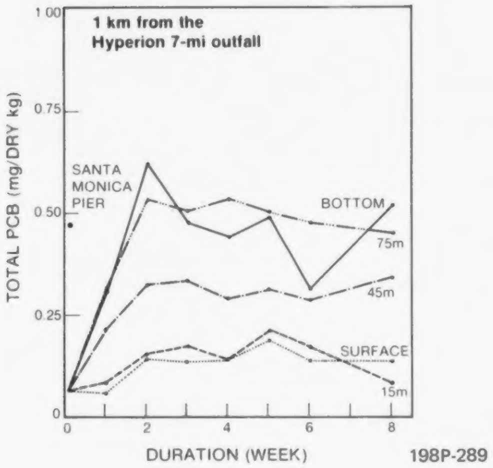


Figure GS-31. Tissue concentrations of PCB in previously uncontaminated mussels (*Mytilus californianus*) suspended at a range of depths near the sewage outfall (unpublished data from SCCWRP, provided by Young).

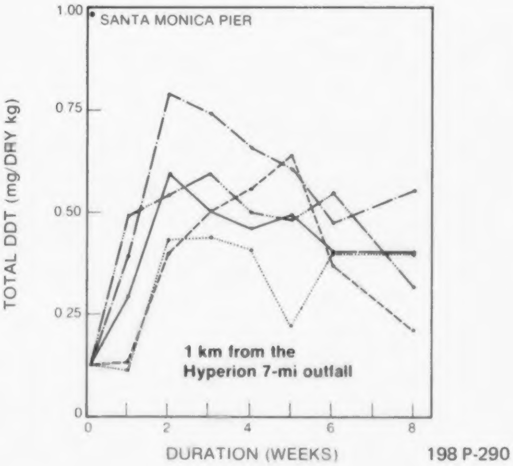


Figure GS-32. Tissue concentrations of DDT in previously uncontaminated mussels (*Mytilus californianus*) suspended at a range of depths near the sewage outfall (unpublished data from SCCWRP, provided by Young).

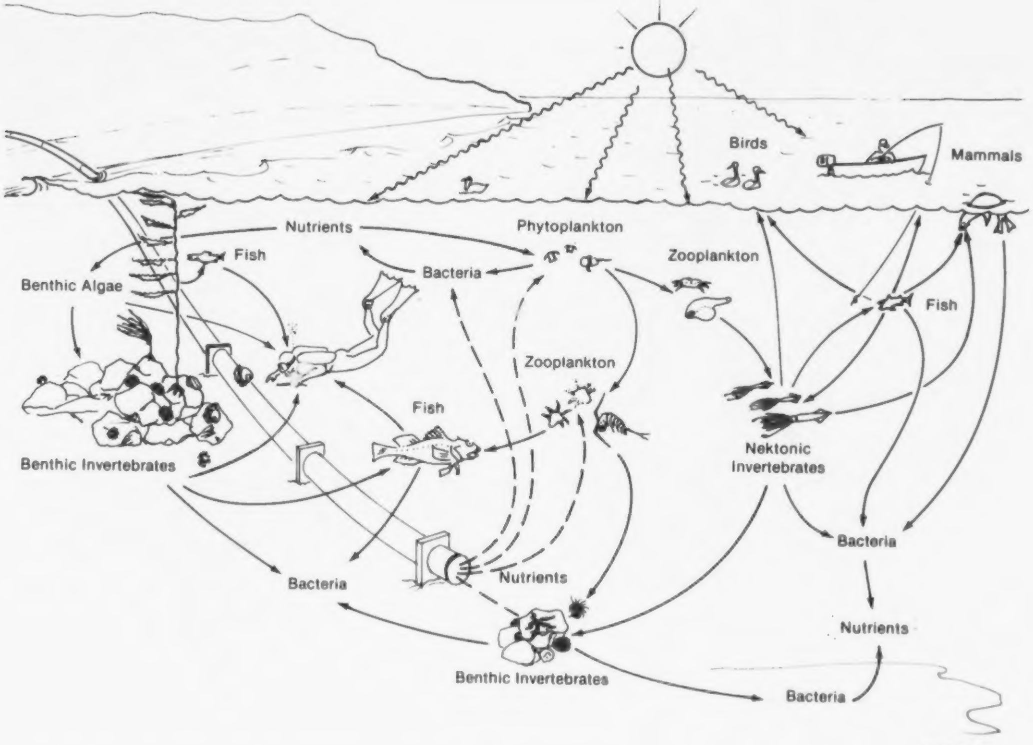

Birds
Mammals
Nutrients
Phytoplankton
Zooplankton
Fish
Benthic Algae
Bacteria
Fish
Zooplankton
Fish
Nektonic Invertebrates
Benthic Invertebrates
Bacteria
Bacteria
Nutrients
Nutrients
Benthic Invertebrates
Bacteria
198P-263

Figure GS-33. Schematic representation of a typical food web in the Southern California Bight showing the influence of a wastewater discharge. Commercial harvesting of kelp and fish are not shown. Some of the pathways will vary with changing habitat types within the Bight, as in areas where there is no benthic algae.

by phytoplankton. Other organic nitrogenous compounds, urea, for example, can be oxidized in seawater with or without the help of microorganisms to release their nitrogen and make it available to phytoplankton.

It must be noted, however, that substances which are either directly toxic to or bioaccumulated to toxic levels in marine organisms are also discharged along with the nutrients. The influence of these toxicants on productivity within each trophic level will vary considerably, ranging from no measurable effect to greater than the potential stimulatory effect of the nutrients. In all of the calculations in the main text on potential productivity resulting from wastewater nutrients, the possible negative effects of toxicants have not been considered. Thus, the results below may well be substantial overestimates of the biomass production resulting from sewage derived nutrients.

(4) SETTLEABLE AND SUSPENDED SOLIDS.

(a) Settleable Solids. Settleable solids can change the benthic environment (ocean floor) in the immediate vicinity of the ocean outfall and affect benthic organisms by: forming bottom deposits; stimulating bacterial growth which depletes dissolved oxygen; increasing concentrations of hydrogen sulfide which is toxic to marine life; causing other adverse effects because they contain heavy metals, chlorinated hydrocarbons, phenolic compounds, and other organic and inorganic compounds; and serving as organic nutrients which stimulate or inhibit the growth of benthic organisms.

(b) Suspended Materials. Particulate material in suspension may affect marine organisms both directly and indirectly.

POTENTIAL DIRECT EFFECTS:

- Decreasing light penetration by absorption and scattering thereby limiting primary productivity in shallow surface waters.
- Clogging the gills of marine organisms resulting in impaired respiration.
- Settling on and smothering organisms.

POTENTIAL INDIRECT EFFECTS:

- Exerting an oxygen demand approximately eight times that of the same material in bottom deposits resulting in adverse environmental conditions and release of toxic materials to the water column.
- Carrying toxic constituents such as heavy metals and chlorinated hydrocarbons which can accumulate in marine sediments or be consumed and incorporated into the body tissues of marine organisms.
- Serving as food for marine organisms and having biostimulatory effects if toxicants do not result in overall reduction in productivity.

d. Possible Adverse Impacts on Marine Life. Some impacts discussed in this section are viewed from the perspective of the Southern California Bight whereas other impacts are correlated with wastewater discharge. The City of Los Angeles' wastewater facility at Hyperion contributes substantial effluent discharge to the Bight.

(1) DIRECT TOXICITY—BIOACCUMULATION AND TOXICITY. Toxicants are chemicals that have toxic physiological effects at some concentration. The toxicants considered in this report are trace metals; chlorinated hydrocarbons, and other potentially toxic substances including phenols and cyanide. In the concentrations that are legally discharged to the waters of the Southern California Bight, most of these chemicals cause only sublethal, if any, effects in the exposed organisms (although direct lethal toxicity occurs to some benthic organisms exposed directly to sewage sludge). The sublethal effects may sufficiently alter a species' (or organism's) ability to compete through altered behavior or reduced reproductive success so that the species is displaced.

Although toxicants may be released from sewage outfalls in low concentrations and be diluted even more by mixing with the ocean waters, many marine organisms are able to concentrate these toxicants in their tissues (bioaccumulation). Toxicants in the water in concentrations too low to cause any noticeable effect in short-term laboratory tolerance studies, may be concentrated in the organism's tissues to the point that lethal or sublethal damage is done. Or, the concentrated toxicants may then be transferred through the food web with no detectable effect on the organism that did the concentrating in the first place. This transfer of toxicants from one trophic, or food, level to the next higher is known as biomagnification.

Predictions of the effects of progressive biomagnification on top carnivores (including marine birds, game fish, marine mammals, and man) must be approached cautiously because the rate of accumulation and body turnover time (often expressed as biological half-life) varies among species and among toxicants. The location within the body of the accumulated toxicants also varies among toxicants. Chlorinated hydrocarbons and some metals are characteristically accumulated in the liver. To a predatory fish or bird that eats its prey whole, the location of the toxicant in the prey is immaterial. To man, who eats only the muscle of most fish, it is of great importance.

Thus, toxicants released by sewage outfalls into the marine environment may reach man, the final consumer, by transfer or biomagnification through the marine food web. Toxicants entering the ocean from a point source (outfall) may have impacts far from where they are released. Toxicants released in the wastewater or eluted from the sludge particulates may be carried long distances by either currents in the ocean or dispersal in food organisms, and seafood containing appreciable concentrations of toxicants may thus occur far from the original sources of the toxicants.

There is considerable evidence that the heavy metals and chlorinated hydrocarbons released from HTP could be directly toxic to organisms encountering them. Table GS-8 summarizes data presented more fully in the main text. In evaluating the data, note that the table is based on undiluted samples. The effluent discharged from HTP is diluted; however, the diluted effluent may still be toxic to some marine organisms near the discharge point. Letter superscripts in the "bioassay" column note the constituents sufficiently concentrated in the undiluted effluent to have adverse effects

Table GS-8. A partial listing of sublethal and lethal effects of wastewater constituents to marine invertebrates and fish. The concentrations discharged in the HTP 5-mile and 7-mile effluents are also given. Potential effects of the various effluent treatments are designated in the bioassay column by effluent column letter superscripts.

CONSTITUENT	CONCENTRATION (mg/l = ppm)					TAXA	EFFECT	REFERENCES (LISTED IN CHAPTER III)
	A 5-MILE EFFLUENT[1]	B 7-MILE EFFLUENT[1]	C PRIMARY TREATMENT[2]	D SECONDARY TREATMENT[3]	BIOASSAY[4]			
Cu^{+2}	0.19	13.9	0.22	0.11	0.1^{ABCD}	Polychaete, *Nereis virens*	Threshold toxicity, 21 days	Becker & Thatcher,1973
					0.1^{ABC}	Bay mussel, *Mytilus edulis*	5% dead, 7 days, 10C	Becker & Thatcher,1973
					0.1^{ABC}	Giant kelp, *Macrocystis pyrifera*	50% inhibition of photosynthesis in 4 days	Becker & Thatcher,1973
					0.1^{ABC}	Limpet, *Acmaea scabra*	Lethal, 3 days	Becker & Thatcher,1973
					0.1^{ABC}	Green abalone, *Haliotis fulgens*	100% kill, 3 days	Becker & Thatcher,1973
					0.1^{ABC}	Gastropod, *Astraea undosa*	100% kill, 5 days	Becker & Thatcher,1973
					0.1^{ABC}	Gastropod, *Tegula spp.*	100% kill, 15-25 days	Becker & Thatcher,1973
					0.1^{ABC}	Sea urchin, *Anthocidaris sp.*	Effect on egg development, 27C	Becker & Thatcher,1973
					0.1^{ABC}	Sea urchin, *Hemicentrotus sp.*	Effect on egg development, 11-16C	Becker & Thatcher,1973
					0.1^{ABC}	Pacific oyster, *Crassotrea gigas*	Effect on egg development 11-16C	Becker & Thatcher,1973
					0.1^{ABC}	Polychaete, *Phyllodoce maculata*	7-day LC_{50}	Oshida, et al., 1976
					0.1^{ABC}	Polychaete, *Ophryotrocha labronica*	No reproduction	Oshida, et al., 1976
					0.08^{ABCD}	Bay mussel, *Mytilus edulis*	Modified sublethal response	SCCWRP, 1973
					0.08^{ABC}	Polychaete, *Mercierella enigmatica*	Modified sublethal response	SCCWRP, 1973
					0.05^{ABCD}	Bryozoan	Deleterious to all stages of development	Becker & Thatcher,1973
					0.05^{ABCD}	Sea urchin, *Paracentrotus lividus*	Lethal	Becker & Thatcher,1973
					0.05^{ABCD}	Gastropod, *Astraea undosa*	100% kill, 14 days	Becker & Thatcher,1973
					$\approx 0.05^{ABCD}$	Diatoms and dinoflagellates	Toxic, 20C	Becker & Thatcher,1973
					0.04^{ABCD}	Bivalve larvae	Lethal	Becker & Thatcher,1973
					0.03^{ABCD}	Dinoflagellate, *Gymnodinium breve*	Minimum amount lethal	Becker & Thatcher,1973
					0.03^{ABCD}	Sea urchin, *Paracentrotus lividus*	Growth of arms disturbed	Becker & Thatcher,1973
					0.025^{ABCD}	Polychaete, *Ophryotrocha labronica*	Growth rate inhibited	Oshida, et al., 1976
					0.024^{ABCD}	Barnacle cyprids	Attachment prevented	Becker & Thatcher,1973
					$>0.02^{ABCD}$	Clam, *Mya arenaria*	Extremely toxic	Becker & Thatcher,1973
					0.02^{ABCD}	Isopod, *Neosphaeroma oregonensis*	First apparent significant response	Becker & Thatcher,1973
					$0.02\text{-}.01^{ABCD}$	Sea urchin, *Paracentrotus lividus*	Slowed growth of pluteus	Becker & Thatcher,1973
					0.005^{ABCD}	Isopod, *Sphaeroma pentodon*	Modified sublethal response	SCCWRP, 1973
					$0.00265\text{-}0.00055^{ABCD}$	Phytoplankton (9 spp.)	Growth inhibited, 7 spp., 20C	Becker & Thatcher,1973
					0.001^{ABCD}	Polychaete, *Nereis diversicolor*	30-50 hr LC_{50}, taken from low Cu sediments	Becker & Thatcher,1973
					0.001^{ABCD}	Polychaete, *Neris diversicolor*	100 hr LC_{50}, taken from high Cu sediments	Becker & Thatcher,1973

Table GS-8 (Cont).

CONSTITUENT	CONCENTRATION (mg/l = ppm)					SPECIES	EFFECT	REFERENCES
	A 5-MILE EFFLUENT[1]	B 7-MILE EFFLUENT[1]	C PRIMARY TREATMENT[2]	D SECONDARY TREATMENT[3]	BIOASSAY[4]			
DDT	0.00072	0.00259	–[5]	–[5]	0.01^{B}	Killifish	Retarded fin regeneration	Weis & Weis, 1975
					50	American Eel	Decreased intestinal water absorption	Janicki & Kinter, 1971
					< 0.1	Grunion Fry	Increased pectoral fin ray asymmetry	Valentine & Soule, 1973
					0.1	Grunion Fry	Lethal	Valentine & Soule, 1973
					0.00053^{AB}	Striped Bass (small)	96-hour LC_{50}	EPA, 1975
					0.0026^{B}	Shiner Perch	96-hour LC_{50}	EPA, 1975
					0.00026^{AB}	Dwarf Perch	96-hour LC_{50}	EPA, 1975
					0.3-1.0	*Pleuronectes platessa*	48-hour LC_{50}	Portmann, 1970
Endosulfan	–[5]	–[5]	–[5]	–[5]	0.33-0.1	*Agonus cataphractus*	48-hour LC_{50}	Portmann, 1970
Azinphos-methyl (insecticide)	–[5]	–[5]	–[5]	–[5]	0.01-0.03	*Pleuronectes limanda*	48-hour LC_{50}	Portmann, 1970
PCB's	0.00036[6]	0.0033[6]	–[5]	–[5]	>10	*Agonus cataphractus*	48-hour LC_{50}	Portmann, 1970
Aroclor 1248					>10	*Agonus cataphractus*	48-hour LC_{50}	Portmann, 1970
Aroclor 1254					>10	*Agonus cataphractus*	48-hour LC_{50}	Portmann, 1970
Aroclor 1260					>10	*Agonus cataphractus*	48-hour LC_{50}	Portmann, 1970
Clophen A30					>10	*Agonus cataphractus*	48-hour LC_{50}	Portmann, 1970
Clophen A60								
Hg^{+2}	0.0032	0.154	0.0041	0.0011	0.230	Killifish	Decreased liver acid phosphatase, RNAase, xanthine oxidase and catalase activity	Jackim, et al., 1970
							Increased liver alkaline phosphatase activity	Jackim, et al., 1970
					0.02^{B}	Killifish	Reduced liver and kidney δ-amino-levalinic acid dehydrogenase activity	Jackim, 1973
					3.3	*Pleuronectes flesus*	48-hour LC_{50}	Portmann, 1970
Ag^{+1}	0.02	0.04	0.03	0.019	0.04^{B}	Killifish	Decreased liver alkaline phosphatase, xanthine oxidase, catalase and RNAase activity	Jackim, et al., 1970
					0.02^{ABC}	Killifish	Increased liver δ aminolevalinic acid dehydrogenase activity	Jackim, 1973
Zn^{+2}	0.24	23.9	0.34	0.23	10^{B}	Killifish	Reduced liver δ aminolevalinic acid dehydrogenase activity	Jackim, 1973
Ammonia	13.8	228	15.8	17	1.2^{ABCD}	Dogfish	Lethal in 193 minutes	Becker & Thatcher, 1973
Detergents	5.1	–[5]	7.7	1.27	>10	*Pleuronectes flesus*	48-hour LC_{50}	Portmann, 1970
Phenol	0.06	–[5]	0.06	0.02	33-100	*Pleuronectes flesus*	48-hour LC_{50}	Portmann, 1970
Cu^{+2}	0.19	13.9	0.22	0.11	0.180^{ABC}	Winter Flounder	Increase in chloride cells with a decrease in mucus cells in gills	Baker, 1969
							Vacuolation of gill epithelial cells	
					1.0^{B}	Winter Flounder	Fatty metamorphosis of liver	Baker, 1969
							Renal necrosis	
							Gross changes in gill structure	
					3.2^{B}	Winter Flounder	Complete cell destruction in gills	Baker, 1969
					0.5^{B}	Killifish & Atlantic Silversides	Lesions in olfactory and lateral line sensory organs	Gardner & LaRoche, 1973
					1.0^{B}	Killifish	Renal lesions	Gardner & LaRoche, 1973
					0.25^{B}	Killifish Zygotes	Reduced survival after hatching by 45 percent	Gardner & LaRoche, 1973
					3.0^{B}	Killifish Zygotes	No hatching	Gardner & LaRoche, 1973
					2.1^{B}	Killifish Larvae	24-hour LC_{50}	Gardner & LaRoche, 1973
					1.2^{B}	Killifish Larvae	48-hour LC_{50}	Gardner & LaRoche, 1973
					1.0^{B}	Killifish Larvae	72-hour LC_{50}	Gardner & LaRoche, 1973
					$1\text{-}3.3^{B}$	*Pleuronectes flesus*	48-hour LC_{50}	Portmann, 1970
					3.2^{B}	Killifish	Decreased liver catalase, RNAase, and acid phosphatase activity	Jackim, et al., 1970
							Increased liver xanthine oxidase activity	
Cr^{+6}	0.0	0.0	0.0	0.0	15	Speckled Sanddab	Decreased feeding in 4 days	SCCWRP, 1975a
					3.7	Speckled Sanddab	Decreased feeding in 14 days	SCCWRP, 1975a
					2.2	Speckled Sanddab	Decreased feeding in 21 days	SCCWRP, 1975a
					31.0	Speckled Sanddab	4-day LC_{50}	SCCWRP, 1975a
					5.4	Speckled Sanddab	21-day LC_{50}	SCCWRP, 1975a
					33-100	*Agonus cataphractus*	48-hour LC_{50}	Portmann, 1970
Cd^{+2}	0.02	1.27	0.03	0.02	27	Killifish	Decreased liver acid phosphatase, xanthine oxidase, catalase and RNAase activity	Jackim, et al., 1970
Pb^{+2}	0.04	1.13	0.05	0.03	188	Killifish	Decreased liver acid phosphatase, xanthine oxidase, catalase and RNAase activity	Jackim, et al., 1970
							Increased liver alkaline phosphatase activity	
					10	Winter Flounder and Killifish	Reduced liver and kidney δ aminolevalinic acid dehydrogenase activity	Jackim, 1973

Notes to Table GS-8

[1] 1974 HTP effluent concentrations (SCCWRP, 1975a) reported as total chemical species of each constituent.

[2] Predicted effluent characteristics based on 1974 treatment reported as concentration for total chemical species of each constituent.

[3] Predicted effluent quality under full secondary treatment with UNOX (Hoeptner, 1976) reported as concentration for total chemical species of each constituent.

[4] Concentration tested in bioassay for specified constituent form.

[5] No data for effluent concentrations.

[6] Total PCBs in effluent.

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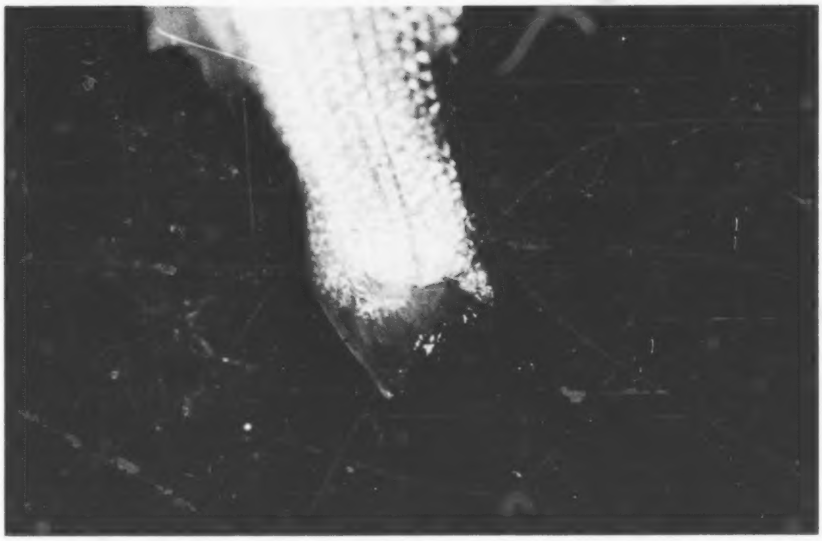
on planktonic and benthic invertebrates and fish. The 5-mile wastewater discharge, for example, releases cadmium, copper, silver, zinc, cyanide, DDT, and Aroclor 1254 in concentrations that may be detrimental, if undiluted, to certain listed marine organisms. The 7-mile sludge and wastewater discharge releases cyanide, silver, cadmium, chromium, copper, iron, mercury, lead, zinc, total DDT, and total PCBs in concentrations that may be detrimental.

(2) DEFORMITIES AND ASYMMETRY. The occurrence of bone deformities and asymmetry of bilateral anatomical characteristics may be other indicators of environmental stress. The California grunion, barred surfperch, and barred sand bass in the area from the Mexican border to the Long Beach Harbor have a higher incidence of gill raker deformities than those from Baja California.

(3) FIN EROSION DISEASE. Fin erosion disease (Figure GS-34) has been found to occur in a number of fish species in the Southern California Bight, and there is reason to believe that fin erosion disease is caused by sewage effluent. Of the 121 species collected in trawls during 1969-1972, 35 species had at least one individual with eroded fins, and the most commonly affected species were Dover sole and white croaker (SCCWRP, 1973). The percentage of species with eroded fins was lowest off Port Hueneme (4 percent) and highest off Palos Verdes (45 percent). Fin erosion occurred in greater than 10 percent of the Dover sole and white croaker collected on the Palos Verdes shelf and at the Hyperion 7-mile sludge outfall in August through October 1971 (Figures GS-35 and GS-36). Thirty-one species of fish collected in trawl samples during 1972-1973 had individuals with eroded fins (SCCWRP, 1974), and Dover sole was the most frequently afflicted species with rex sole second. The incidence of fin erosion in Dover sole was 39 percent off Palos Verdes, 1.7 percent in Santa Monica Bay, and 2.3 percent in San Pedro Bay (SCCWRP, 1975a). In the May to June trawls in Santa Monica Bay, fin erosion disease was observed in 9.1 percent of the slender sole, 9.5 percent of the greenblotched rockfish, and 1.3 percent of the Dover sole (Mearns et al., 1974). Most of the observations occurred in the vicinity of the HTP sludge outfall. At Dana Point during



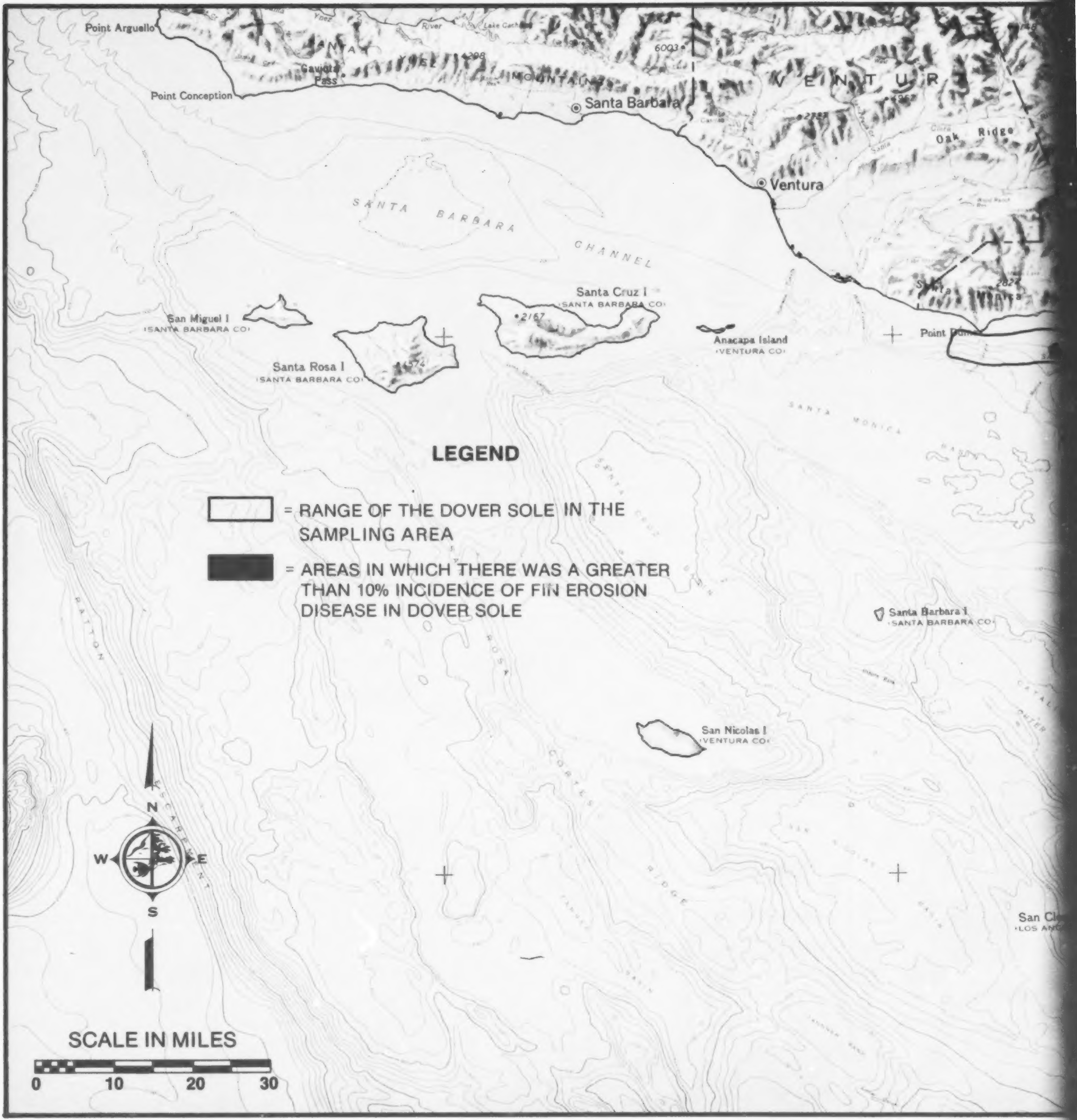
198P-417

Figure GS-34. Fin erosion afflicts Dover sole and white croaker (shown above) living in the vicinity of ocean outfalls and areas of waste discharge.

1972-1974 sampling, 0.68 percent of the Dover sole had eroded fins while none were affected off Point Loma (1975) or Santa Catalina Island (1972-1974). The overall occurrence in Dover sole from 1972 to 1976 was 39 percent on the Palos Verdes shelf, 3.5 percent in Santa Monica Bay, 2.0 percent in south San Pedro Bay, and 0.67 percent at Dana Point (Mearns and Sherwood, in press).

(4) TUMORS. Tumor-like growths (Figure GS-37) have been reported for at least 10 species of flatfish from along the Pacific coast of North America (Mearns and Sherwood, 1974), but there is no indication that they can be attributed to sewage effluents. In a 1969-1972 trawling survey in southern California waters, tumors were found on Dover sole, slender sole, hornyhead turbot, and California tonguefish with the highest incidence of tumors (1.3 percent) in small Dover sole (SCCWRP, 1973). During the 1972-1973 trawls, tumors were found on nine species of fish with Dover sole being affected most frequently (SCCWRP, 1974). The incidence in Dover sole collected off Palos Verdes was 1.0 percent for all sizes and up to 15.6 percent for small individuals. In the 1974 trawls (SCCWRP, 1975a) five species of tumor-bearing fish were collected, and the incidence in Dover sole was 0.5 percent.

(5) LIP PAPILLOMAS. Lip papillomas [tumor-like sores (Figure GS-38)] have been found on white croakers, tongue soles, basketweave cusk-eels, and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Point Conception
Gaviota Pass
Santa Barbara
Ventura
Oak Ridge
SANTA BARBARA CHANNEL
San Miguel I
SANTA BARBARA CO
Santa Rosa I
SANTA BARBARA CO
Santa Cruz I
SANTA BARBARA CO
Anacapa Island
VENTURA CO
SANTA MONICA
Santa Barbara I
SANTA BARBARA CO
San Nicolas I
VENTURA CO
PATTON ESCARPMENT
SANTA ROSA CORTES RIDGE
LEGEND
= RANGE OF THE DOVER SOLE IN THE SAMPLING AREA
= AREAS IN WHICH THERE WAS A GREATER THAN 10% INCIDENCE OF FIN EROSION DISEASE IN DOVER SOLE
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Figure GS-35. The occurrence of fin erosion disease in Dover sole collected by trawl in August through October 1971 (from SCCWRP, 1973). Depths are in fathoms.

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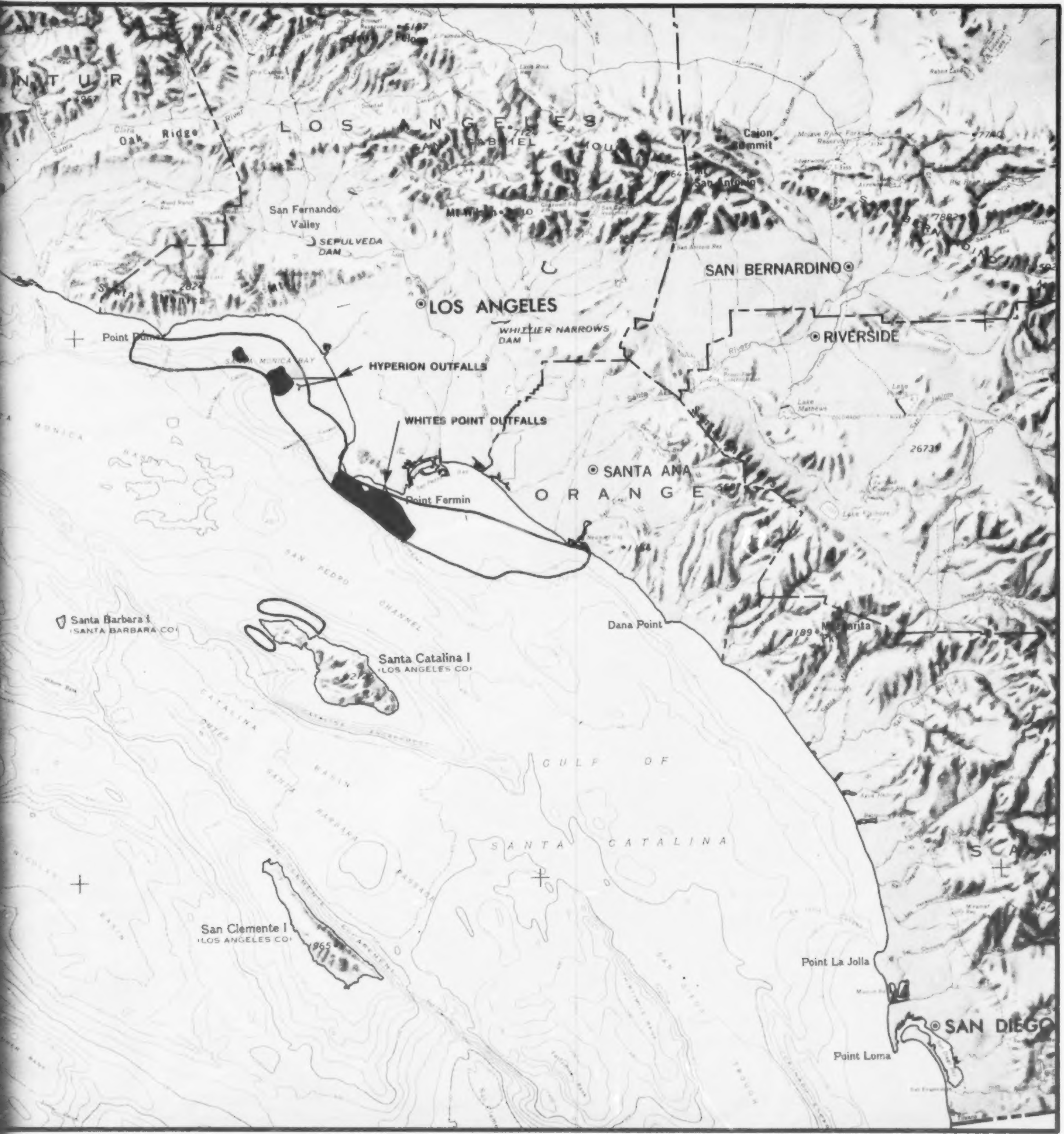
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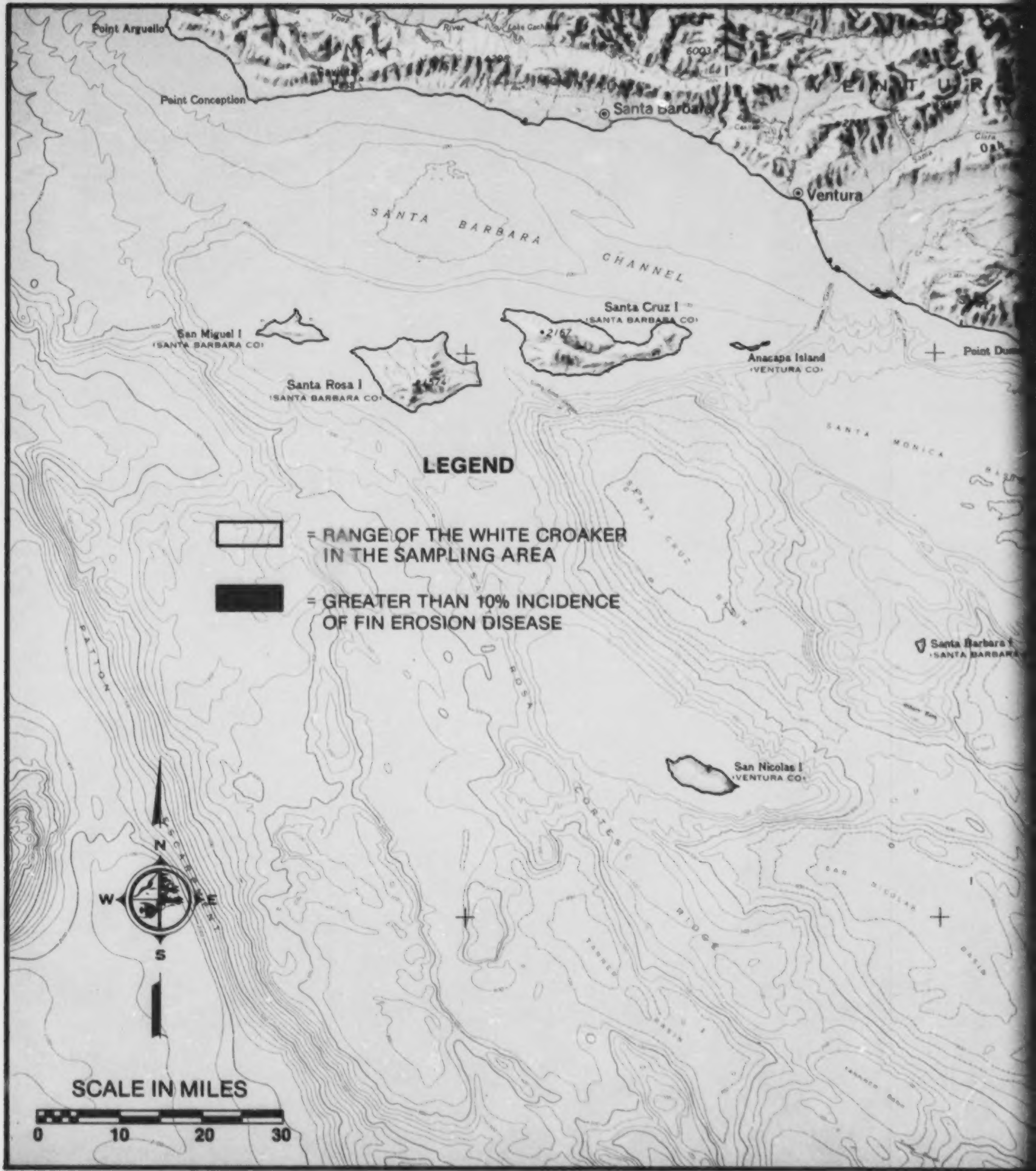
Oak Ridge
San Fernando Valley
SEPULVEDA DAM
Mt Wilson
SAN GABRIEL
Cajon Summit
Mt San Antonio
SAN BERNARDINO
LOS ANGELES
WHITTIER NARROWS DAM
RIVERSIDE
Point Dume
SANTA MONICA BAY
HYPERION OUTFALLS
WHITES POINT OUTFALLS
SANTA ANA
ORANGE
Point Fermin
SAN PEDRO CHANNEL
Dana Point
Santa Barbara I
(SANTA BARBARA CO)
Santa Catalina I
(LOS ANGELES CO)
GULF OF SANTA CATALINA
San Clemente I
(LOS ANGELES CO)
Point La Jolla
SAN DIEGO
Point Loma

198P-305


Point Arguello
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Anacapa Island
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SANTA MONICA
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= RANGE OF THE WHITE CROAKER IN THE SAMPLING AREA
= GREATER THAN 10% INCIDENCE OF FIN EROSION DISEASE
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ROSA
PATTON
ESCARPMENT
San Nicolas I
(VENTURA CO)
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Figure GS-36. The occurrence of fin erosion disease in white croaker collected by trawl in August through October 1971 (from SCCWRP, 1973). Depths are in fathoms.

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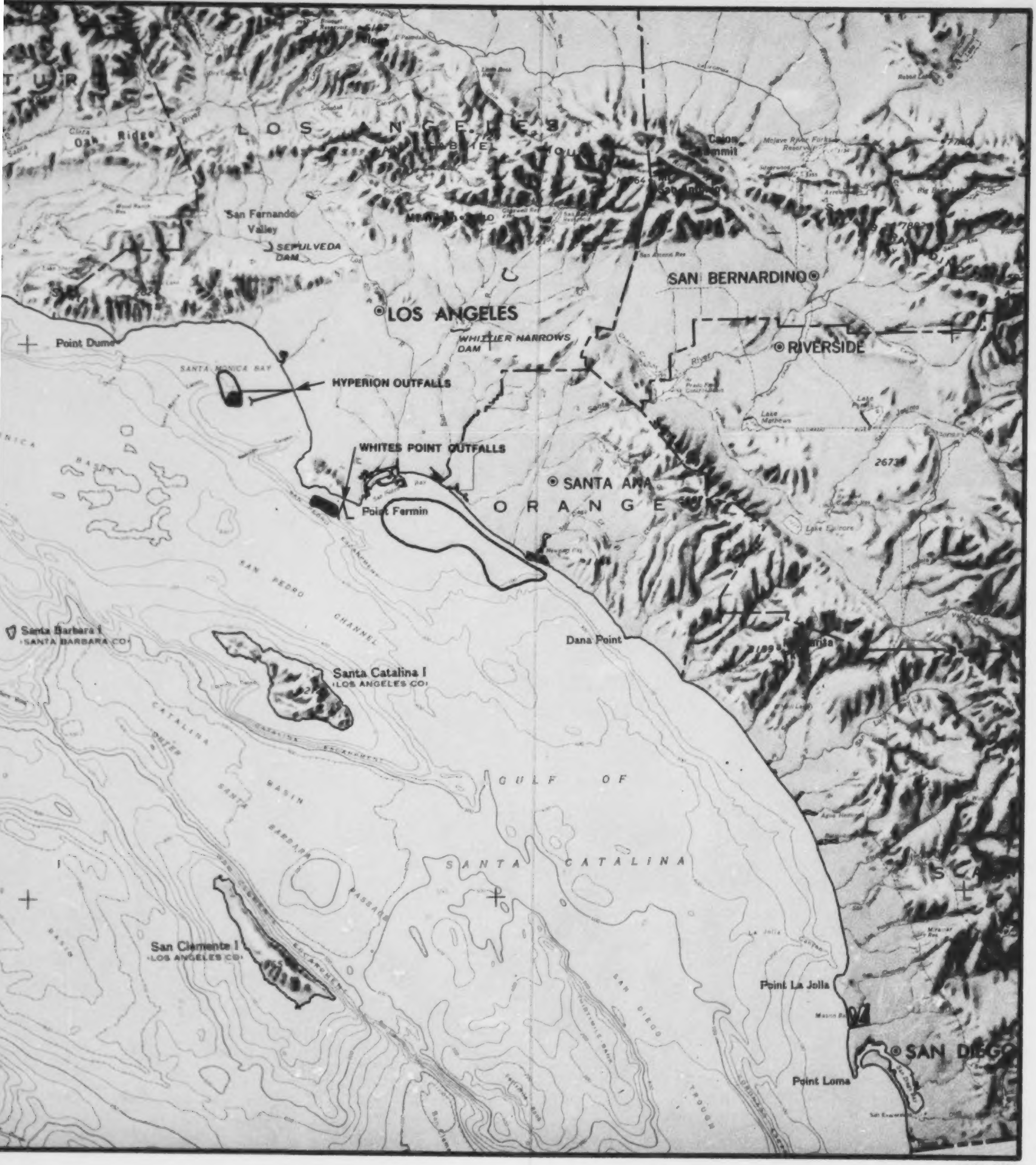
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Oak Ridge
San Fernando Valley
SEPULVEDA DAM
Caion Summit
Mojave River Forks Reservoir
SAN BERNARDINO
LOS ANGELES
WHITTIER NARROWS DAM
RIVERSIDE
Point Dume
SANTA MONICA BAY
HYPERION OUTFALLS
WHITES POINT OUTFALLS
Point Fermin
SANTA ANA
ORANGE
Lake Mathews
Lake Elsinore
2673
SAN PEDRO CHANNEL
Santa Barbara I
SANTA BARBARA CO
Santa Catalina I
LOS ANGELES CO
Dana Point
CATALINA BASIN
SANTA BARBARA
GULF OF SANTA CATALINA
San Clemente I
LOS ANGELES CO
SAN DIEGO TROUGH
Point La Jolla
La Jolla
SAN DIEGO
Point Loma

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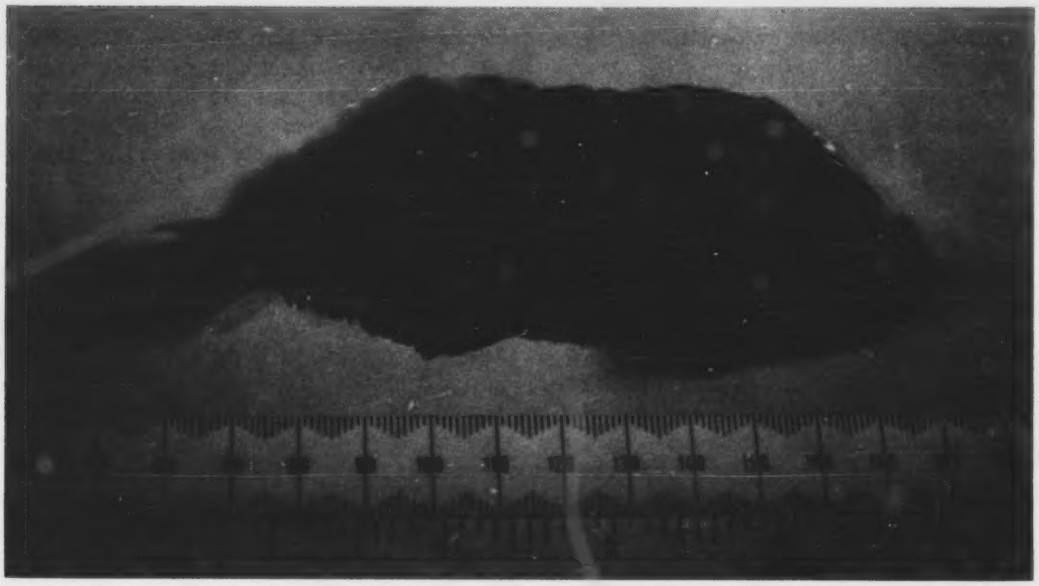
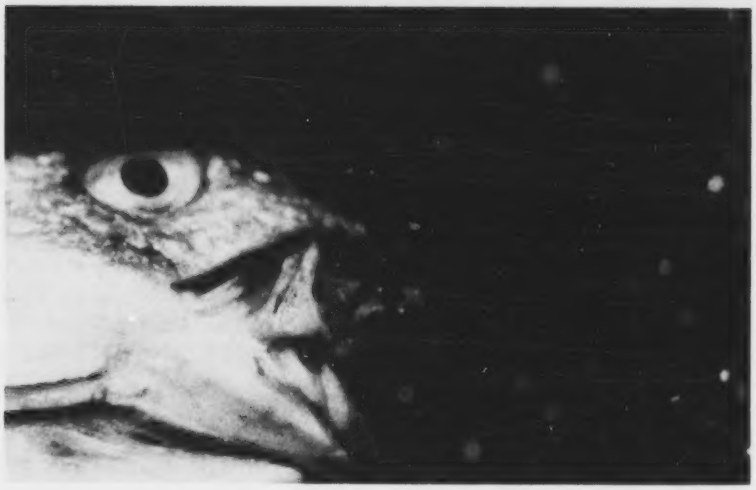


198P-304

Figure GS-37. Large epidermal papilloma on a juvenile Dover sole, *Microstomus pacificus*.



198P-418

Figure GS-38. Lip papilloma on a fish. The location where the fish was collected was unspecified.

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Pacific sanddabs taken in Santa Monica Bay and the Los Angeles-Long Beach Harbor since 1956, and such tumors have not been observed on fish from unpolluted areas (Young, 1964). Histological examination of the white croaker papillomas revealed they were not malignant; thus, they were probably caused by mechanical or chemical irritation or infection (Russel and Kotin, 1957).

(6) RED TIDES. The effect of nutrients reaching surface waters from upwelling and/or sewage effluents can cause almost immediate blooms of diatoms, which may be followed upon cessation of nutrient input by similar population explosions of dinoflagellates, a group to which red tide algae belong. Direct or indirect correlation of toxic red tide blooms to sewage discharge, however, is difficult to establish because diatoms usually outcompete dinoflagellates in the vicinity of a continuous nutrient input. Thus, a certain sequence of events generally occurs before a red tide bloom: a) initiation of nutrient input, b) diatom bloom, c) cessation of nutrient input, and d) diatom population die-away. Phytoplankton production in general near the HTP outfalls has been shown to be elevated in surface waters at certain times of the year but not at others, indicating intermittent periods of eutrophication from periodically surfacing effluent plumes.

(7) KELP DIE OFF. In the past, kelp has occurred in Santa Monica Bay from Point Dume to past Malibu towards Santa Monica, as well as along the Palos Verdes Peninsula. During the period 1957 through 1959, unusually warm water persisted throughout the year causing most kelp in Southern California to deteriorate, and some beds even disappeared. Along Palos Verdes, the beds have been showing a regrowth (but not extensive) in the past 2 to 3 years (W. North, personal communication).

Kelp undergoes cyclical natural succession along the coast of Southern California (except at Santa Barbara) during which all or part of a kelp bed dies off and new plants grow up (North, 1971). Grazers such as sea urchins, however, can destroy a kelp bed and prevent its return. For instance, the sea urchins, *Strongylocentrotus franciscanus* and *S. purpuratus* were found to have dense populations ($\geq 50/m^2$ at Palos Verdes) where kelp beds formerly occurred, and these high densities prevent kelp reestablishment by cropping young sporophytes (North and Pearse, 1970). Removal of the urchins allowed kelp and other vegetation to grow in this area. The increase in urchin population is probably caused by removal of otters (urchin predator), depletion of abalone (food and substrate competitor), and sewage (potential food source for urchins)(North and Pearse, 1970) (see Figure GS-16).

It is very likely that industrial and domestic wastewater discharges have affected kelp beds in the past. However, field observations of kelp (*Macrocystis*) transplanted to locations near the Point Loma and JWPCP outfalls showed no apparent toxic effects of the effluents (SCQCB, 1964).

In addition, kelp grows within 305 m (1,000 ft) of the Santa Barbara outfall (mainly domestic wastes) and is apparently quite healthy, although the discharge has decreased water clarity somewhat. The plants survive in more turbid water by translocation of nutrients synthesized in the surface canopy to the lower parts of the plant.

Laboratory studies showed that Point Loma sewage diluted 1:10 with seawater reduced photosynthesis in and damaged young kelp blades in 42 hours while 1 percent sewage caused a distinct stimulation in photosynthesis over a 15-day period. Further studies in the laboratory showed the toxic levels of wastewater constituents to be 0.1 ppm for Cu^{+2}, 10 ppm for Cr^{+6}, 0.1 ppm for Hg^{+2}, 13 ppm for Zn^{+2}, 1 ppm for Ni^{+2}, >94 ppm for phenols, 0.5 ppm for chlorinated phenols, 100 ppm for diesel oil, and no effect for Pb. JWPCP effluent diluted to 2, 1, and 0.5 percent did not measurably reduce photosynthesis in kelp blades during 2 to 6 day exposures and were even stimulated in some cases (SWQCB, 1964).

Perennial colonies of *Macrocystis* in Santa Monica Bay became restricted to east of Malibu Point late in the 1950s. What colonies remained in the west end of the Bay , grew from a maximum depth of about 35 feet and more shallow up to the intertidal. Occasionally a plant or two will be found on the Marina del Rey breakwater or the Venice breakwater, but their existence is shortlived. A few other colonies now exist off Sunset Boulevard and Topanga Canyon and at Las Tunas Beach. These have made their appearance after a number of houses and septic tanks were removed along the adjacent shoreline. Historically, *Macrocystis* grew in parts of Santa Monica Bay and on the breakwaters at Venice and Santa Monica, off Sunset Boulevard, off Topanga Canyon, and on up the coast to Malibu. It also grew in deep water, out to 90 feet or more. It was accompanied by *Pelagophycus* in the deeper water (R. Fay, personal communication). Kelp began to die off along the coast of Southern California in the late 1940s, and it was suggested in the Revelle and Wheelock report of 1954 that the die-off was associated with the discharge of industrial wastes.

(8) MUSSELS. California bay mussels apparently are very good indicators of concentrations of chlorinated hydrocarbons too low to be measured by standard analytical methods. A single study using those mussels suspended in the water about 1 km from the 7-mile outfall showed that chlorinated hydrocarbons (DDT and PCBs) were present in concentrations high enough to be accumulated by the mussels. These toxic substances probably come either from effluent currently being discharged or from sediments previously deposited through the outfalls. This result suggests that other toxic substances of sewage origin may be present in the water near the outfall in concentrations too low to be directly toxic to any organism group, but high enough to be concentrated biologically.

Extremely large specimens of *Mytilus californianus* can no longer be found in the vicinity of waste discharges. They can be found in cleaner waters, however, i.e., Point Dume, and on the offshore oil rigs. Two possible explanations for this are that (1) predation (including collection by man for food or bait) has increased, or that (2) toxins of sewage origin are at higher levels in the water than previously so that mussels may accumulate them to lethal levels before they reach large size (R. Fay, personal communication).

(9) MAMMAL DISEASES. The effects of DDT and PCBs on marine mammals may be to induce reproductive failure. California sea lions that had premature pups were found to have total DDT levels 8 times those in the blubber and 3.8 times those in the liver of females having normal deliveries (DeLong et al., 1973). PCB levels were similarly elevated, 6.6 and 4.4 times those in the blubber and liver of the normal delivery females. Anas (1974) reported total DDT plus PCB concentrations in the blubber of harbor seals from the western Pacific. The mean (geometric) concentrations in blubber were 610.7 ppm (range = 380.7 to 2,350.0 ppm) at San Miguel Island, 862.7 ppm (range = 459.4 to 1,620.9 ppm) in Puget Sound, 62.5 ppm (range = 27.7 to 109.9 ppm) in the Columbia River, and 11.3 ppm (range = 6.8 to 27.8 ppm) for the Pribilof Island seals. San Miguel Island within the Bight has the highest concentration.

(10) BIRD POPULATION DECREASES. Marine birds such as the brown pelican nesting on California's offshore islands have suffered from the inability to lay hard-shelled eggs. Evidence supports the theory that DDT or its derivatives may be the causative agents.

Both DDT and PCBs alter physiological processes in birds. For example, DDE (a metabolite of DDT) apparently inhibits carbonic anhydrase and ATPase in the oviduct which results in eggs with thin shells that break during natural incubation or do not hatch at all.

Mercury is another wastewater constituent that is bioaccumulated by marine birds via the food web. The concentrations ingested and/or accumulated in the tissues may be lethal to the organism or have indirect effects such as reducing the hatchability of eggs. The sublethal effects of mercury and chlorinated hydrocarbons are summarized in the main text.

From this information, it is apparent that discharges of chlorinated hydrocarbons and mercury in the HTP effluent could indirectly cause reproductive failures in marine birds through biomagnification in the food web.

Brown pelican populations have been making a comeback indicating that the situation is improving.

(11) ATTRACTION/AVOIDANCE. Wastewater effluents, especially the solids, can attract fish and other marine organisms. The suspended solids, metals, and or chemicals can also cause marine life to avoid the area of discharge. The avoidance phenomena can occur at pollutant concentrations below those which cause acute or chronic toxicity.

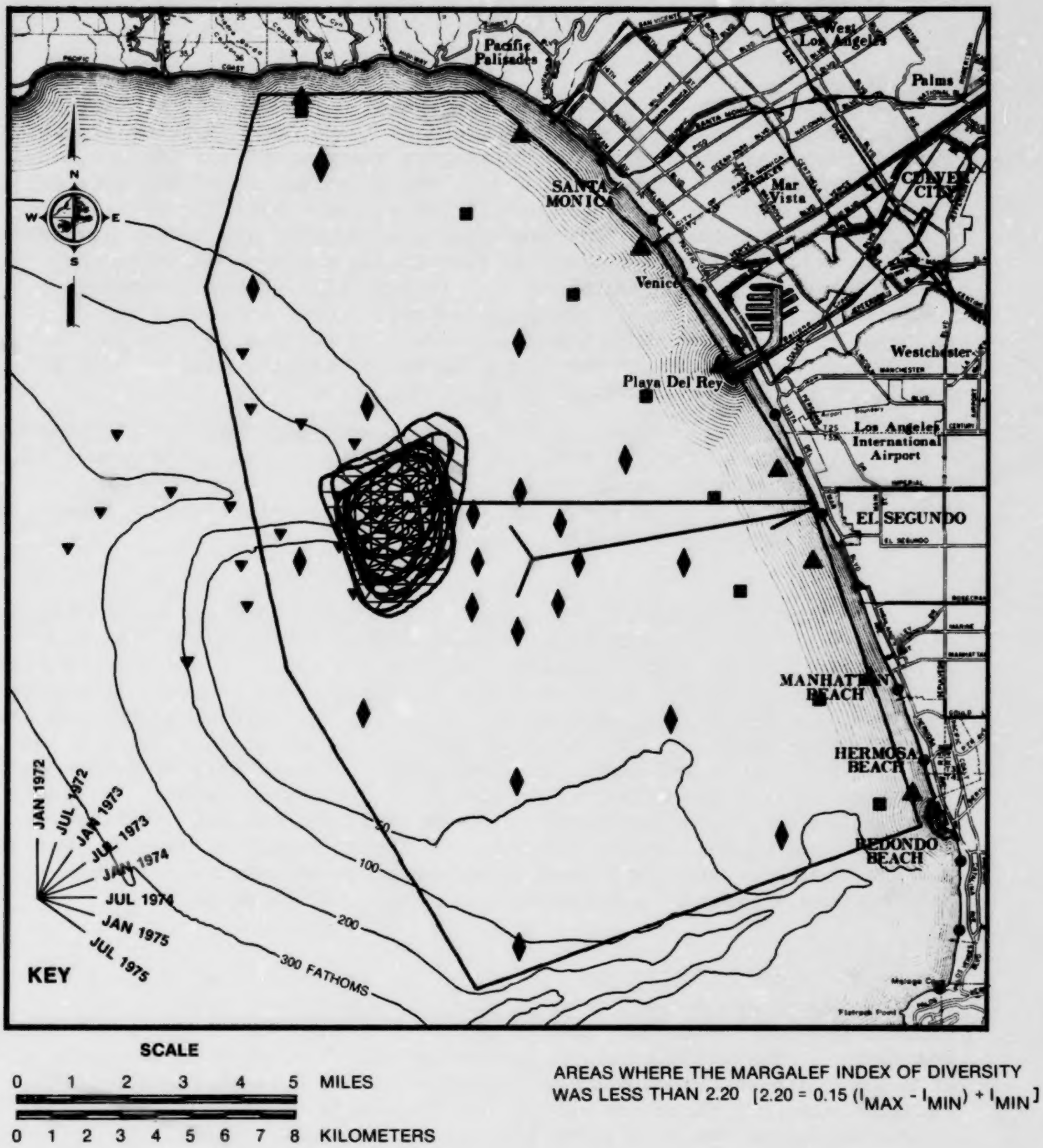
Carlisle (1969) suggested that the speckled sanddab was attracted to the vicinity of the 7-mile discharge, and at least three species (speckled sanddab, yellowchin sculpin, and California tonguefish) tend to avoid the area surrounding the 5-mile discharge. The reevaluation of the data collected at 60 m near the 5-mile outfall and at 100 m near the sludge outfall showed a reduction in the mean number of species and median number of fish per trawl relative to sampling stations at the same depth up the coast (Mearns et al., unpublished). This reduction may be a natural phenomenon or related to wastewater discharge. Data collected at 180 m in depth from stations near the sludge field in Santa Monica Canyon showed a tendency toward a depression in the number of species present with a possible increase in abundance.

Changes in species diversity are sometimes used to assess environmental stress (see Figure GS-39). A decrease in species diversity is generally assumed to indicate a degradation in the environment. However, environmental stresses may occur with no change in species diversity as a result of shifts in species composition.

(12) DEPLETED BASINS. No benthic algae occur in ocean basins because of the limited light penetration at the depth of the basins. Some basins are heavily populated with animals, but others are relatively impoverished. The impoverished basins, such as the three shallow ones closest to shore (San Pedro, Santa Monica, and Santa Barbara Basins), are characterized by reduced oxygen levels below the sill depth which may account for the lack of organisms. This low oxygen is a result of large amounts of decomposable organic matter in the water and sediments of the basins, and it is likely that wastewater discharges along the coast add to these low oxygen levels. The populated basins include the Catalina, Santa Cruz, San Nicolas, Tanner, and San Clemente Basins and contain an abundance of polychaetes, ophiuroids, holothurians, crinoids, brachiopods, urchins, and sea whips.

(13) MARINE PRODUCTIVITY. Most of the commercial and recreational species landed are pelagic fish or near-shore predatory species such as halibut and rockfish. The coastal marine fish fauna of Southern California has changed considerably in the past 30 years. Many of the previously abundant sport and commercial species have almost disappeared (sardines, Pacific mackerel, giant sea bass), and the remaining major fish stock is restricted to the seasonally migrating tunas (BLM, 1975). The changes in the abundance of commercial and sport species may be attributable to fishing pressure, although pollution and habitat destruction have undoubtedly had some effect (see Figure GS-40). Trawls conducted from 1958 through 1963 showed that the mean number of species and the median number of fish per trawl were apparently lower near the HTP outfalls than in control areas at the same depth.

Harvesting of abalone is accomplished only by diving, and harvest of these marine gastropods in California has decreased from about 2,041,200 kg/yr


Pacific Palisades
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SANTA MONICA
Mar Vista
CULVER CITY
Venice
Westchester
Playa Del Rey
Los Angeles International Airport
EL SEGUNDO
MANHATTAN BEACH
HERMOSA BEACH
REDONDO BEACH
N
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50
100
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300 FATHOMS
KEY
JAN 1972
JUL 1972
JAN 1973
JUL 1973
JAN 1974
JUL 1974
JAN 1975
JUL 1975
SCALE
0 1 2 3 4 5 MILES
0 1 2 3 4 5 6 7 8 KILOMETERS

AREAS WHERE THE MARGALEF INDEX OF DIVERSITY WAS LESS THAN 2.20 [$2.20 = 0.15 (I_{MAX} - I_{MIN}) + I_{MIN}$]

198P-50

Figure GS-39. This figure shows an index of diversity in the vicinity of the sludge discharge indicating a depression in the number of species.

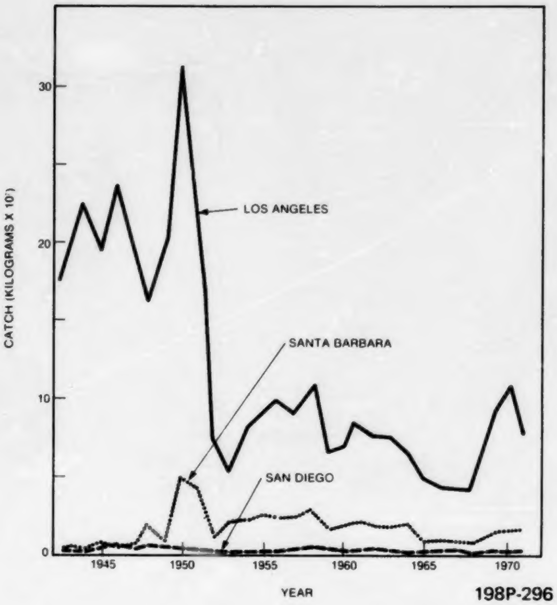


Figure GS-40. Commercial fish and shellfish landings by wet weight in Southern California for the period 1943 through 1971 (adapted from SCCWRP, 1973).

(4,500,000 lbs/yr) for the period 1957 to 1962 to 1,531,807 kg/yr (3,377,000 lbs/yr) between 1968 and 1973. The catch brought into Los Angeles decreased from 708,977 kg/yr (1,563,000 lbs/yr, $372,000) in 1968 to 283,046 kg/yr (624,000 lbs/yr, $190,000) in 1972. It has been speculated that increased consumer demands, illegal-size collections, decreased habitats, and poor water quality around sewage and industrial outfalls may have contributed to the decline of abalone populations (BLM, 1975).

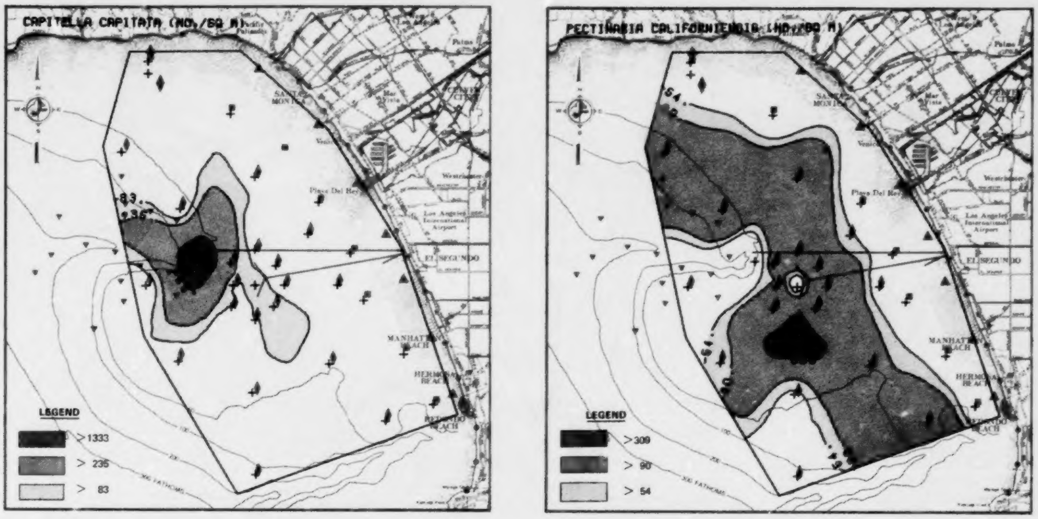
During most of the year, phytoplankton productivity was elevated in the surface waters over the outfall although the maximum productivity potential predicted from nutrient concentrations was not achieved, apparently as a result of the toxicants released with the nutrients.

Figures GS-41, GS-42, and GS-43 show examples of both enhancement and depression of productivity of various species.

(14) OTHER POTENTIAL IMPACTS: CRAB "BURN-SPOT DISEASE." "Burn-spot disease," consisting of exoskeletal lesions have been examined on the crab, *Mursia gaudichaudii* and *Cancer* spp., collected off Palos Verdes, Santa Monica, and Newport Beaches as far seaward as the 123-meter (405-foot) contour (Sindermann and Rosenfield, 1967). The cause of the lesions has not been identified, but they appear to be contagious, and generally are

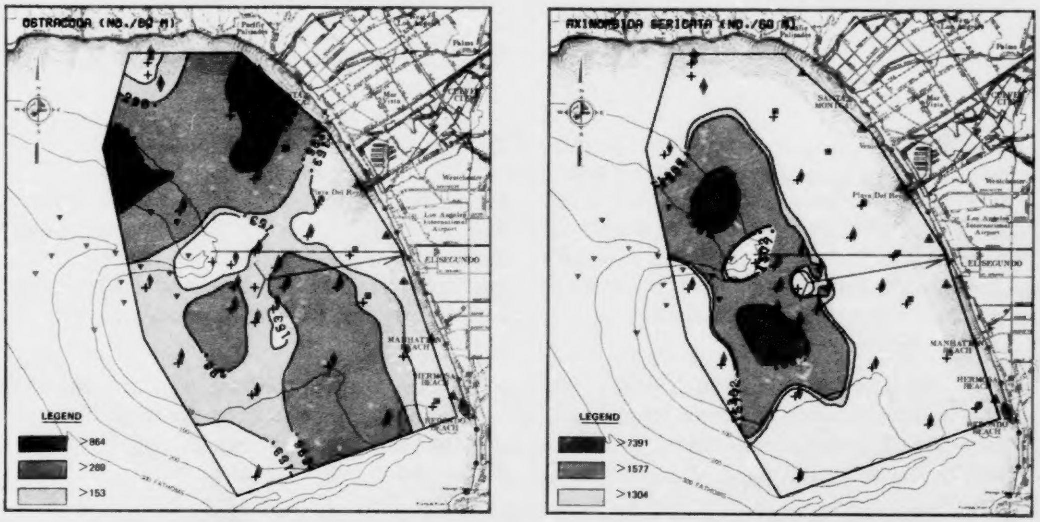
POLYCHAETE WORM

CONE WORM (POLYCHAETE)


CAPITELLA CAPITATA (NO./SQ M)
83
235
Pacific Palisades
Palms
Santa Monica
Culver City
Mar Vista
Venice
Westchester
Playa Del Rey
Los Angeles International Airport
El Segundo
Manhattan Beach
Hermosa Beach
Redondo Beach
LEGEND
> 1333
> 235
> 83
PECTINARIA CALIFORNIENSIS (NO./SQ M)
54
LEGEND
> 309
> 90
> 54

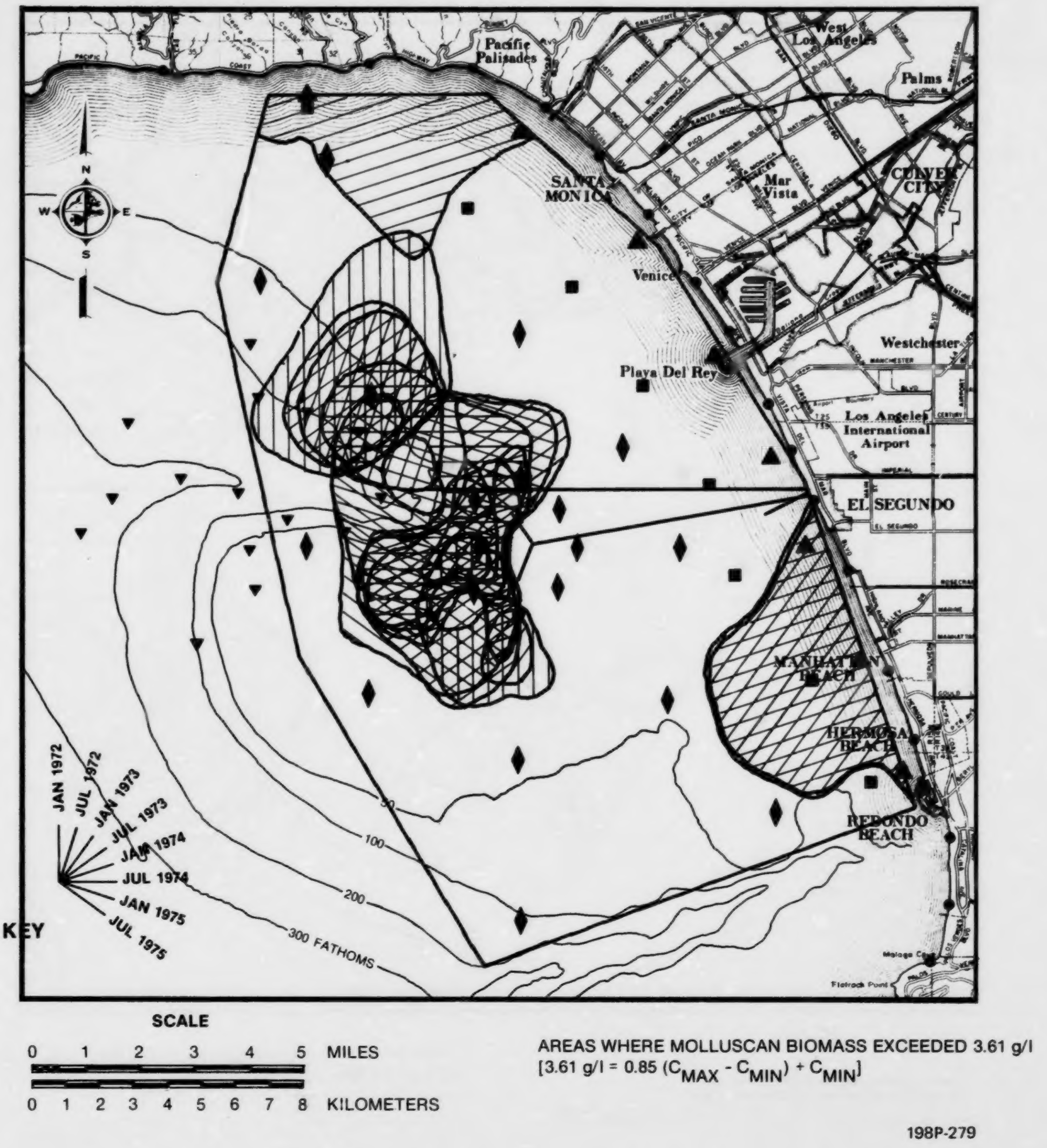
OSTRACODA (BIVALVE CRUSTACEANS, INCLUDING *EUPHILOMEDES CARODONTA* AND OTHERS)

BIVALVE MOLLUSC


OSTRACODA (NO./SQ M)
289
153
Pacific Palisades
Palms
Santa Monica
Culver City
Mar Vista
Venice
Westchester
Playa Del Rey
Los Angeles International Airport
El Segundo
Manhattan Beach
Hermosa Beach
Redondo Beach
LEGEND
>864
>289
>153
AXINOPSIDA SERICATA (NO./SQ M)
1304
1577
LEGEND
>7391
>1577
>1304

198P-419

Figure GS-41. Distribution of benthic organisms in the vicinity of the HTP outfalls in January 1972. The locations where samples were taken are shown by a +. The isopleths are computer-drawn at the mean and 15 and 85 percentile density.


Pacific Palisades
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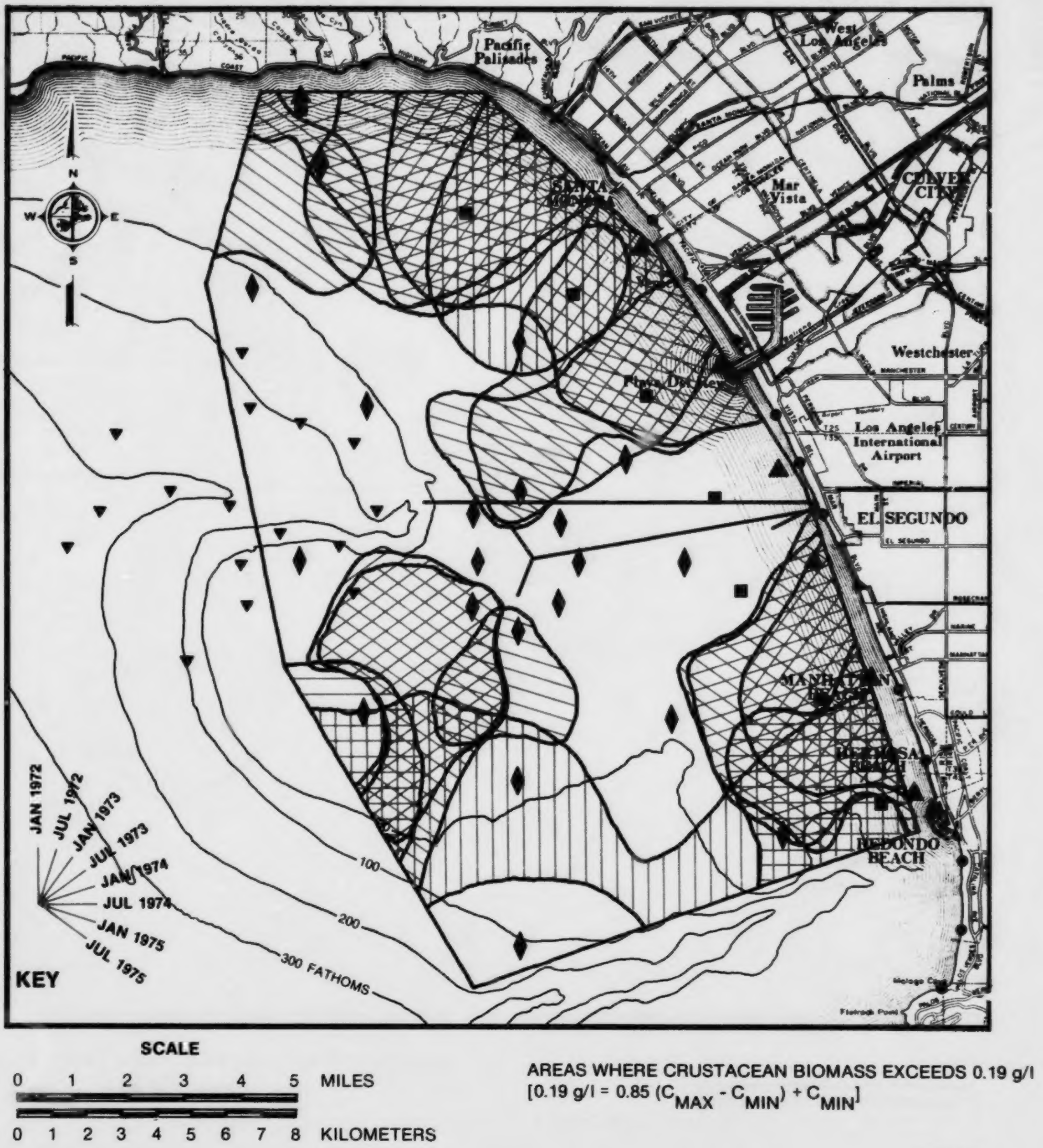
Palms
SANTA MONICA
Mar Vista
CULVER CITY
Venice
Westchester
Playa Del Rey
Los Angeles International Airport
EL SEGUNDO
MANHATTAN BEACH
HERMOSA BEACH
REDONDO BEACH
Malaga Cove
Flatrock Point
N
W
E
S
50
100
200
300 FATHOMS
KEY
JAN 1972
JUL 1972
JAN 1973
JUL 1973
JAN 1974
JUL 1974
JAN 1975
JUL 1975
SCALE
0 1 2 3 4 5 MILES
0 1 2 3 4 5 6 7 8 KILOMETERS
AREAS WHERE MOLLUSCAN BIOMASS EXCEEDED 3.61 g/l
[3.61 g/l = 0.85 (C_MAX - C_MIN) + C_MIN]
198P-279

Figure GS-42. Areas where the molluscan biomass in the benthic sediments exceeded 3.61 g/l for the period January 1972 through July 1975. The contours are computer-drawn (unpublished data from HTP).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Culver City
Westchester
Playa Del Rey
Los Angeles International Airport
El Segundo
Manhattan Beach
Hermosa Beach
Redondo Beach
N
S
E
W
KEY
JAN 1972
JUL 1972
JAN 1973
JUL 1973
JAN 1974
JUL 1974
JAN 1975
JUL 1975
100
200
300 FATHOMS
SCALE
0 1 2 3 4 5 MILES
0 1 2 3 4 5 6 7 8 KILOMETERS
AREAS WHERE CRUSTACEAN BIOMASS EXCEEDS 0.19 g/l
[0.19 g/l = 0.85 (CMAX - CMIN) + CMIN]
198P-281

Figure GS-43. Areas where the crustacean biomass in the benthic sediments exceeded 0.19 g/l for the period January 1972 through July 1975. The contours are computer-drawn (unpublished data from HTP).

lost during molting. Lesions occurred in $\leq$70 percent of the crabs sampled at each location. Lesions were found in young crabs near the heads of submarine canyons off Santa Monica, Palos Verdes, and Newport Beach, while larger crabs with lesions were found more widely dispersed suggesting that crabs may spread the disease as they disperse. No link has been established between the disease and municipal waste discharges, but there are outfalls in the vicinity of the canyons where crabs with lesions were found.

e. Public Health Impacts. Although little is known about the direct public health impacts of HTP outfalls in Santa Monica Bay, several potential problems exist. As mentioned previously, pathogenic bacteria and viruses that do not die soon after discharge may contaminate fish or shellfish, rendering them unfit or dangerous for human consumption. Swimming or other water body contact sports near sewage outfalls may result in infections or illnesses although HTP discharges are of such a depth that effluents rarely reach the surface or shoreline during the summer swimming season. Bioaccumulation of toxicants such as heavy metals and chlorinated hydrocarbons is known to occur throughout the food web, and commercial catches of fish and shellfish are regulated by the FDA standards.

Another aspect of public health concern is that the FDA standards apply only to fish for sale to the public and not to the fish caught and eaten by the sport fisherman. Thus, people regularly catching and eating contaminated fish from the Los Angeles area, particularly near Palos Verdes and the Los Angeles Harbor, may be exposed to a considerable amount of mercury and DDT.

Mercury is the only metal for which there is an FDA standard for the edible parts of fish and shellfish, and this standard is 0.5 ppm (mg/wet kg). In the Southern California Bight, the concentrations reported for Dover sole liver (nonedible tissue) have not exceeded this level. The concentrations of mercury in species present in the Los Angeles area have been reported from several locations, and those for Santa Monica Bay are discussed below. A number of species from the coast of Oregon (area of few sewage outfalls) have also been tested for mercury (Childs and Gaffke, 1973). Rex sole, Dover sole, petrale sole, English sole, sand sole, starry flounder, canary rockfish, flag rockfish, yellowtail rockfish, rougheye rockfish, sablefish, lingcod, Pacific hake, and arrowtooth flounder had significantly less than 0.5 ppm while all of the spiny dogfish sampled contained more than 0.5 ppm. There was no relationship between concentration and size, sex, weight and length, or location.

Frozen swordfish steaks have been reported to have 0.49 to 2.60 ppm of total mercury of which over 93 percent was methylmercury, and canned tuna to have 0.04 to 0.55 ppm of total mercury of which over 90 percent was methylmercury (Kamps et al., 1972). Although most of the mercury in fish tissue is in the methyl form, fish are not known to methylate mercury. Methylated mercury is the most toxic form, and the methylation must occur before the fish ingests it (Jensen and Jernelov, 1972). To attribute the concentration of a substance (mercury, for example) in fish in the open ocean to the original source of the contaminant is difficult at best, and usually impossible unless there is only one likely source. The wastewater from Hyperion Treatment Plant does not constitute a unique source of any toxic or nutrient compound; consequently, the effects of alterations of the effluent from HTP on the open ocean must be viewed as resulting in proportionately small incremental changes in the oceanic pollution load.

The market crab, *Cancer anthonyi,* is a scavenger that feeds on bottom material which may be heavily contaminated. Chlorinated hydrocarbon concentration in the muscle and gonads of specimens collected near the major municipal sewage outfalls during 1971 and 1972 did not exceed the federal limit of 5 ppm for DDT and PCB compounds in edible tissues (SCCWRP, 1974). But PCB levels in flesh of crabs living near the Hyperion 7-mile outfall were significantly higher than in crabs from other sections of the Bay. In general, however, Aroclor 1254 contamination of this crab is low but widespread in coastal waters. Gonadal tissues may contain concentrations of these synthetic organic compounds 5 to 20 times that of flesh.

The potential for biomagnification of chlorinated hydrocarbons (especially PCBs) particularly those from wastewater discharges, is of much concern. EPA has banned or limited the use of many chlorinated hydrocarbons known to have adverse effects on health and the environment. Some of these (such as DDT, aldrin, dieldrin, heptachlor, and chlordane) have been banned as potential human carcinogens. The dramatic increases in chemically induced cancers during the last half century indicate that much more care needs to be exercised in the use of chemicals and control of potential environmental pollutants.

Another public health concern related to wastewater bacteria is the drug resistance found naturally in enterobacteria. This bacteria drug resistance has been found not only in humans, but also in domestic animals, fish, river water receiving sewage (Davies and Rownd, 1972), and sewage sludge in the New York Bight (Koditschek and Guyre, 1974). The resistance is produced by an extrachromosomal genetic element, called an R factor, that can be transferred by conjugation or transduction to bacteria of different species. Thus far, resistance has been found for at least ten antibiotics as well as several other antimicrobials, such as heavy metals (Davies and Rownd, 1972). Multiple resistance also occurs, although all of the resistance determinants are not known to occur simultaneously in one R factor isolated from nature.

The R factor transmission from sewage (wastewater or sludge) to humans occurs via ingestion of contaminated water or poorly cooked fish and shellfish. The R factor is then transferred to the normal resident flora in the intestine which maintains it. Pathogens, such as *Salmonella* or *Shigella,* entering the body may subsequently receive the R factor from these bacteria, thus becoming resistant to the drugs used for treatment of the diseases caused by these organisms (SWRCB, 1975).

The "University Task Force to Evaluate Water Quality Effects of Hyperion Sludge Discharge" prepared a report for the California State Water Resources Control Board (May, 1977). The report concludes that:

> It is obvious that the environment around the 7-mile line is unhealthy for many, but not all, species. We do not recommend eating fish caught in the vicinity of the Hyperion outfalls, because of the accumulation of halogenated hydrocarbons.

4. SOCIOECONOMIC CHARACTERISTICS OF THE CITY OF LOS ANGELES

The socioeconomic characteristics of a wastewater treatment service area are largely responsible for determining the wastewater facility needs of the area. Future needs are predicted by considering existing conditions and making predictions about the changes expected over the lifetime of proposed projects. Finally, impacts of proposed projects on the socioeconomic environment must be evaluated and where adverse indirect effects can be identified, mitigation measures are examined. A summary of socioeconomic conditions in the City of Los Angeles and surrounding areas is provided here to assist the reader in understanding projected needs for the total wastewater system capacity and for local relief of anticipated major hydraulic constraints, secondary impacts associated with various types of facilities plans, and the possibilities for mitigating actions.

a. Land Use Patterns. The City of Los Angeles, with 2.76 million residents, is characterized by low density development over the majority of its 469 square miles. Major residential emphasis has been upon the single family detached dwelling although, more recently, multiple family dwellings have developed along major boulevards and freeways. Recreational opportunities are varied with mountains and seashore both within easy commuting distance.

The recreational emphasis is upon large multiple use open spaces such as the Sepulveda and Hansen Flood Control Basins and the nearly 7 square mile Griffith Park area. The developed area of Griffith Park, nearly 3 square miles, is the largest municipal recreational area in the nation, and the park has the distinction of being one of the few City parks in which forest fires can and do occur.

As the financial, commercial, industrial, and tourist center of Southern California, Los Angeles offers diverse employment opportunities. Commercial activity is centered just west of the downtown area although additional commercial enterprises are located in the Wilshire Corridor, along Santa Monica Boulevard, and adjacent to major streets throughout the City. Industry is concentrated in the harbor, along the Los Angeles River in the eastern portion of the City and along the Southern Pacific Railroad lines that traverse the northeastern and central sections of the San Fernando Valley. The different existing land uses are shown in Figure GS-44.

Table GS-9 gives the land use of Los Angeles and of the cities in the wastewater service area. The extent of land use development in most

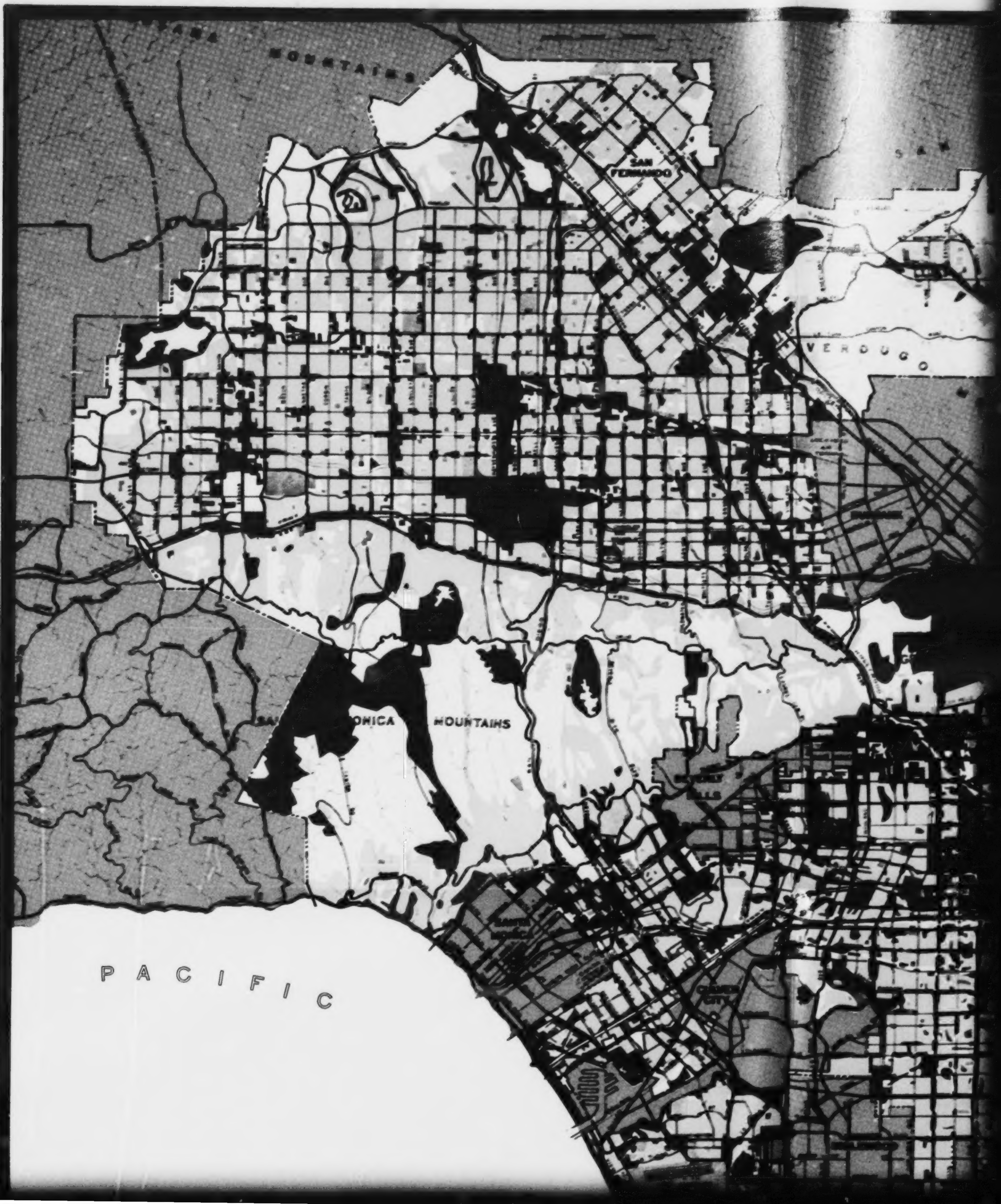
Table GS-9. Land use in Los Angeles and wastewater contract cities.

AREA	RESIDENTIAL			COMMERCIAL	INDUSTRIAL	OPEN LAND/ AGRICULTURAL	PARKS/ RECREATION	PUBLIC SERVICES/ INSTITUTIONAL	OTHER MISC.	VACANT	TOTAL ACREAGE
	SINGLE FAMILY	MULTI-FAMILY	TOTAL								
BEVERLY HILLS (1974)											
Acres	2,053	229.6	2,282.6	267.4	3.9	—	73.5	93.5	—	38.2	2,759
Percent	74.4	8.3	82.7	9.7	0.1	—	2.7	3.4	—	1.4	100
BURBANK (1974)											
Acres	2,970	810	2,780	540	1,290	—	—	2,990	2,340	N.A.	10,940
Percent	27.1	7.4	34.5	4.9	11.8	—	—	27.3	21.4	N.A.	99.9
CULVER CITY (1973)											
Acres	N.A.	N.A.	1,643	527	341	—	31	186	217	155	3,100
Percent	N.A.	N.A.	53	17	11	—	1	6	7	5	100
EL SEGUNDO (1974)											
Acres	398	83	482	83	1,505	216	209	38	398	566	3,497
Percent	11.4	2.4	13.8	2.4	43.1	6.2	6.0	1.1	11.4	16.2	100
GLENDALE (1974)											
Acres	4,626	1,289	5,915	777	296	—	—	2,489	297	6,581	16,355
Percent	28.3	7.9	36.2	4.8	1.8	—	—	15.2	1.8	4.0	100
LOS ANGELES* (1976)											
Acres	123,039	726	145,765	12,331	15,061	8,876	3,142	4,767	44,559	75,445	309,924
Percent	39.7	7.3	47	3.9	4.9	27	1	1.5	14.4	24.3	99.7
SANTA MONICA (1976)											
Acres	1,358	1,019	2,377	308	415	16	205	443	1,527	43	5,334
Percent	25.5	19	44.5	5.8	7.7	0.3	3.9	8.4	28.6	0.8	100
SAN FERNANDO (1974)											
Acres	N.A.	N.A.	620	113	180	—	40	—	457	140	1,550
Percent	N.A.	N.A.	40	7.3	11.6	—	2.6	—	29.5	9	100

*Source: City of Los Angeles Planning Data Systems Unit, 1976.

Note: Does not include invalid acreage totals, but does include both publicly and privately owned land.

A


MOUNTAINS
SAN FERNANDO
VERDUGO
ONICA MOUNTAINS
CULVER CITY
PACIFIC

B

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SAN GABRIEL
SAN FERNANDO
VERDUGO MOUNTAINS
GLENDALE
SOUTH PASADENA
BEVERLY HILLS
MONTEREY PARK

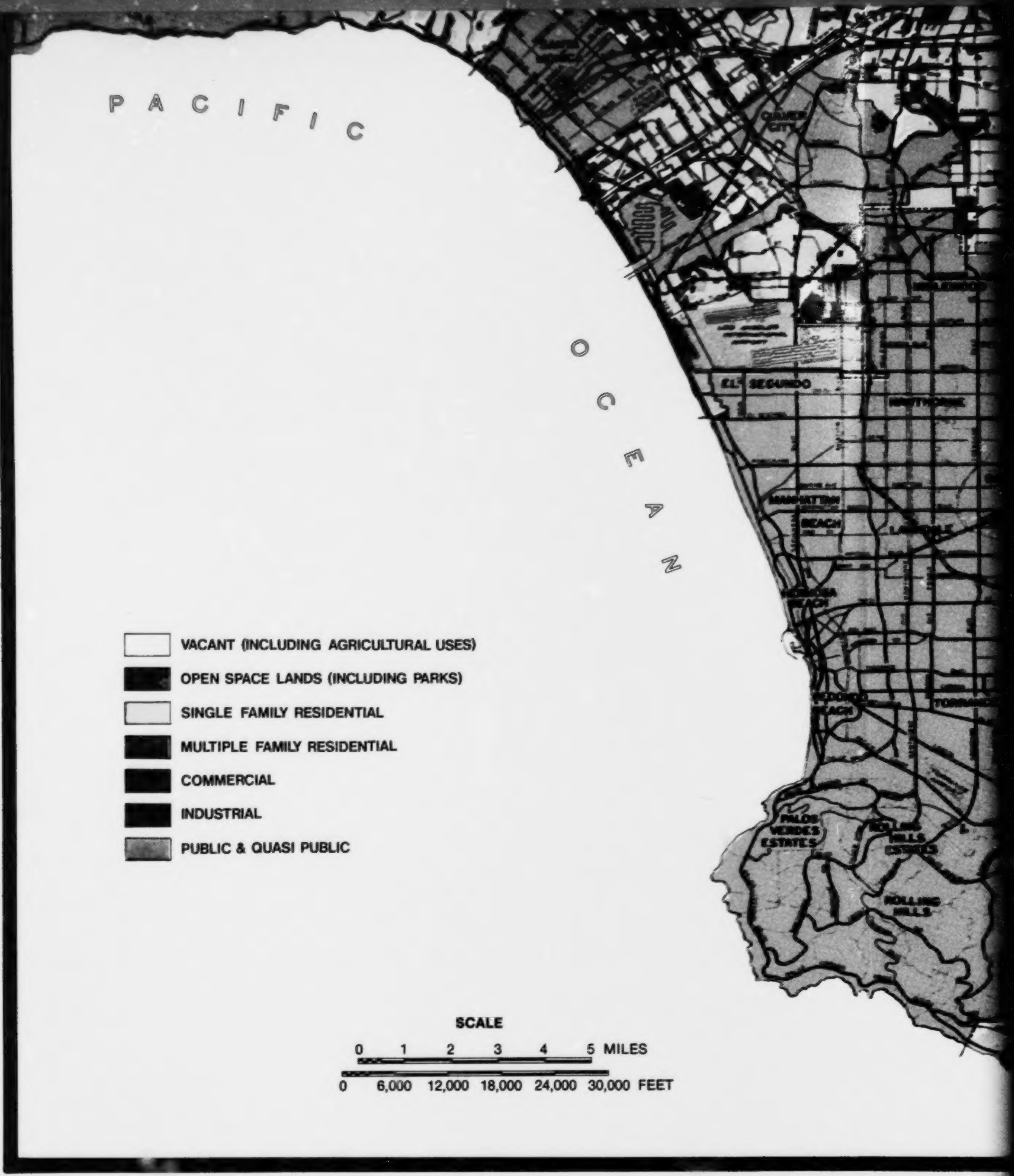
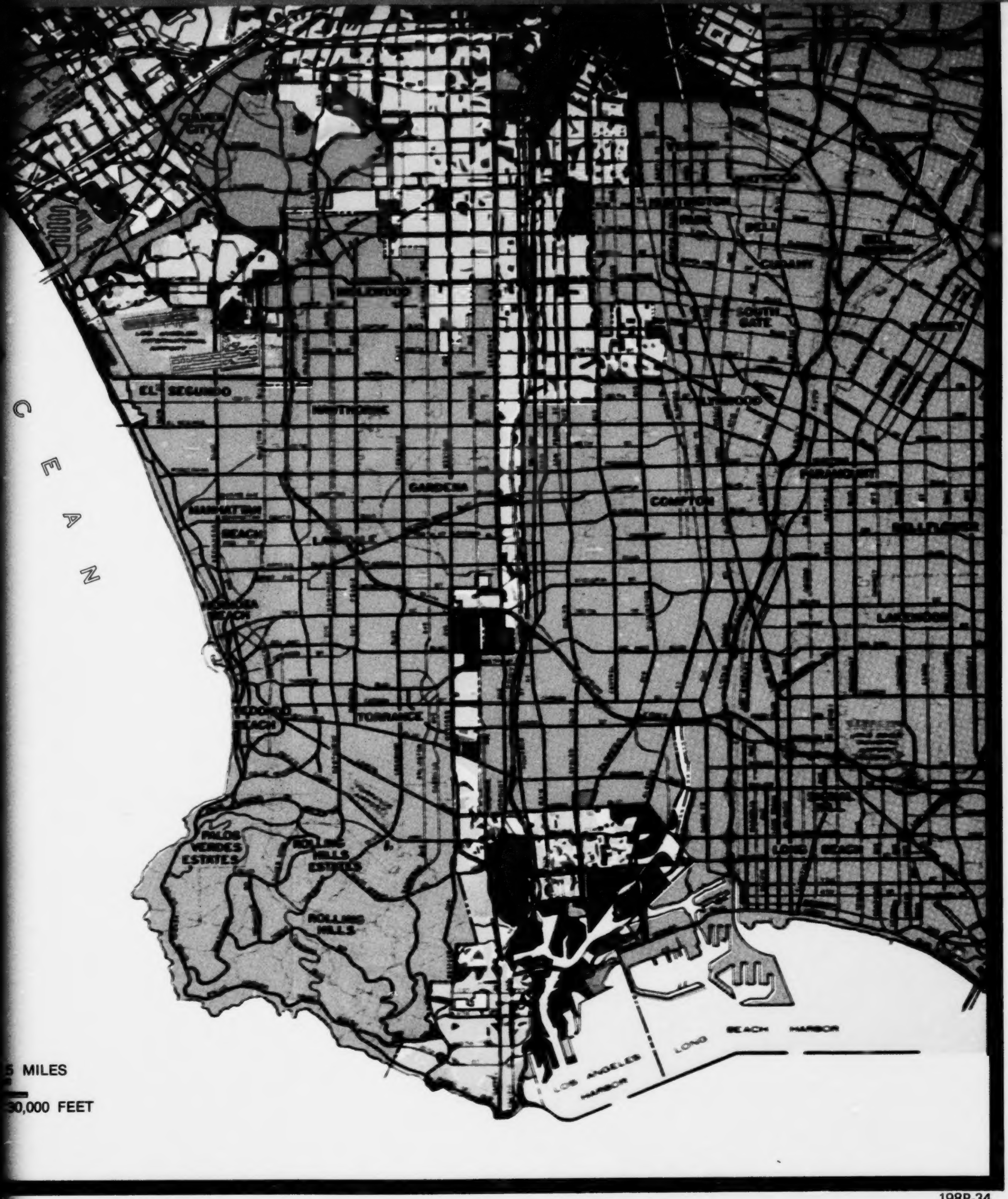

PACIFIC
OCEAN
CULVER CITY
INGLEWOOD
EL SEGUNDO
HAWTHORNE
MANHATTAN BEACH
LAWNDALE
HERMOSA BEACH
REDONDO BEACH
TORRANCE
PALOS VERDES ESTATES
ROLLING HILLS ESTATES
ROLLING HILLS
VACANT (INCLUDING AGRICULTURAL USES)
OPEN SPACE LANDS (INCLUDING PARKS)
SINGLE FAMILY RESIDENTIAL
MULTIPLE FAMILY RESIDENTIAL
COMMERCIAL
INDUSTRIAL
PUBLIC & QUASI PUBLIC
SCALE
0 1 2 3 4 5 MILES
0 6,000 12,000 18,000 24,000 30,000 FEET

Figure GS-44. 1974 existing land use for the City of Los Angeles.


CULVER CITY
INGLEWOOD
MAYWOOD
HUNTINGTON PARK
BELL
CUDAHY
SOUTH GATE
EL SEGUNDO
HAWTHORNE
LYNWOOD
CEAN
PARAMOUNT
GARDENA
COMPTON
MANHATTAN BEACH
LAWNDALE
BELLFLOWER
HERMOSA BEACH
LAKEWOOD
REDONDO BEACH
TORRANCE
SIGNAL HILL
PALOS VERDES ESTATES
ROLLING HILLS ESTATES
LONG BEACH
ROLLING HILLS
LONG BEACH HARBOR
LOS ANGELES HARBOR
5 MILES
30,000 FEET

198P-34

f Los Angeles.

D

4P

of the contract cities and unincorporated areas is well established; most additional development would have to be through the recycling of developed land.

From Table GS-9, it can be seen that 47 percent of City acreage is used for residential purposes, 3.9 percent for commercial, and 4.9 percent for industrial. The remaining 44 percent is divided into agricultural uses (2.7 percent), recreational (1 percent), institutional (1.5 percent), vacant lands (24.3 percent), and other uses (14.4 percent). Combining vacant lands with acres in agricultural use results in a total of 27 percent, or 83,679 acres, of City land potentially developable.

Variations of land uses within specific geographical areas in the City of Central Los Angeles, San Fernando Valley, Western Los Angeles, and the Harbor Area are detailed in Table GS-10. For example, the San Fernando Valley contains over three-quarters of the City's 8,876 acres devoted to agricultural uses (Figure GS-45); Western Los Angeles has nearly all the remaining agricultural land with Central Los Angeles and the Harbor Area having only minimal acreage devoted to agriculture.

Table GS-10. Land uses in geographical areas of Los Angeles.[1]

GEOGRAPHICAL AREA	AGRICULTURAL (NO. OF ACRES/ % OF CATEGORY)	RESIDENTIAL (NO. OF ACRES/ % OF CATEGORY)	COMMERCIAL (NO. OF ACRES/ % OF CATEGORY)	INDUSTRIAL (NO. OF ACRES/ % OF CATEGORY)	ALL OTHER USES (NO. OF ACRES/ % OF CATEGORY)	VACANT[2] (NO. OF ACRES/ % OF CATEGORY)
San Fernando Valley	6,890/78	73,188/50	4,990/40	6,336/42	21,329/41	39,055/52
Western Los Angeles	1,969/22	29,981/21	1,087/9	2,103/14	11,540/22	21,891/29
Central Los Angeles	8/0	37,739/26	5,675/46	4,237/28	14,085/27	10,962/14
Harbor Area	9/0	4,857/3	579/5	2,385/16	5,514/10	3,536/5
TOTALS	8,876/100	145,765/100	12,331/100	15,061/100	52,468/100	75,445/100

Source: City of Los Angeles Planning Data Systems Unit.

[1] Data given does not include invalid acreage totals, but does include both publicly and privately owned land.

[2] Vacant lands do not include agricultural lands.

The ratio of single to multiple family residential acreage is large, indicating the unique low-density residential character of Los Angeles. In the San Fernando Valley, this ratio is 11 to 1 (i.e., 11 single family acres to 1 multi-family acre) and in Western Los Angeles, it is 10 to 1. Even in the higher density Central City and Harbor areas, the ratios are 2 to 1 and 3 to 1, respectively (City of Los Angeles Planning Data Systems Unit, 1975).

The extensive development of Los Angeles, with residential use concentrated in single family dwellings, requires an extensive sewage system to collect and concentrate the flows for cost-effective treatment. In addition, land available for development or recycling has the potential for increasing flow rates beyond the hydraulic capacity of the existing

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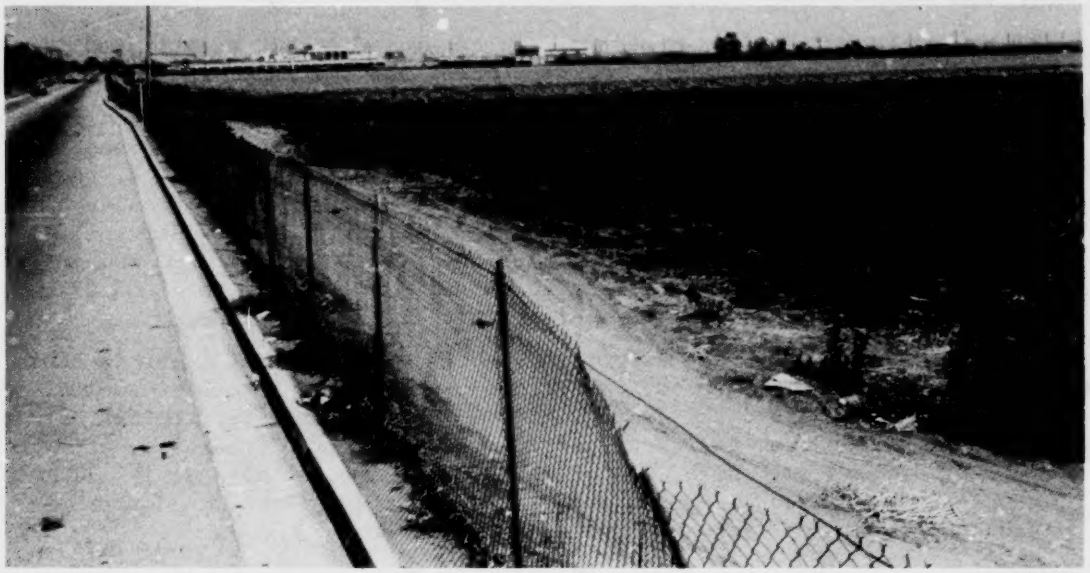


198P-36

Figure GS-45. The San Fernando Valley contains approximately 6,900 acres devoted to agricultural uses. This parcel, between Plummer and Nordhoff Streets in the western end of the San Fernando Valley, has residential uses to the north, commercial to the east, and industry to the west and south. This area is slated for industrial development in the city planning guidelines for the community plans.

system. The location of remaining vacant land in the City and other land not developed to maximum zoning are good indications of the areas which will be urbanized in the future. Table GS-11 details the remaining privately owned vacant land in the City of Los Angeles. Figures are given by zoning categories in each of the thirty-five planning areas and four geographical areas of the City.

Vacant land comprises 87,534 acres in the City, 58 percent of which is privately owned. Vacant land in the San Fernando Valley accounts for about one-half of the City vacant land privately held. Vacant land in Central Los Angeles, Western Los Angeles, and the Harbor Area comprise 12 percent, 28 percent, and 5 percent of the total City vacant land not publicly held.

Sites over 5 acres in size which are typical of parcels that could be subdivided for future residential development are generally located in the San Fernando Valley and in the Western Santa Monica and Verdugo Mountains.

b. Land Use Planning. In April, 1974, the Los Angeles City Council adopted the Concept for the City's General Plan and the Citywide Plan

Table GS-11. Privately owned vacant land summary by zones in the City of Los Angeles Planning Areas.

GEOGRAPHICAL AREA	ZONED AGRICULTURE		ZONED RESIDENTIAL		ALL OTHER ZONING		TOTAL VACANT LAND	
Planning Area	# ACRES	# PARCELS	# ACRES	# PARCELS	# ACRES	# PARCELS	# ACRES	# PARCELS
CENTRAL LOS ANGELES	82	36	4,741	19,976	1,243	7,858	6,066	28.980
Wilshire	0	0	141	788	121	473	262	1,261
Westlake	0	0	69	496	77	508	146	1,004
Southeast Los Angeles	0	0	198	1,834	247	1,936	445	3,770
Central City	0	0	8	41	182	1,391	190	1,432
Hollywood	0	0	2,334	5,098	81	431	2,415	5,529
Northeast Los Angeles	82	36	1,559	8,843	191	976	1,832	9,855
South Central Los Angeles	0	0	141	950	130	931	271	1,881
Silverlake-Echo Park	0	0	246	1,562	81	368	327	1,930
North & East Central City	0	0	5	47	79	443	84	490
Boyle Heights	0	0	40	317	54	401	94	718
WESTERN LOS ANGELES	553.2	9	13,273	8,721	465	1,547	14,291.2	10,277
Palms-Mar Vista del Rey	31	4	50	333	65	205	146	542
West Adams-Leimert-Baldwin Hills	0	0	164	657	105	528	269	1,185
Century City-Rancho Park-West Los Angeles	0	0	39	305	41	209	80	509
Brentwood-Pacific Palisades	522	4	9,042	1,814	40	76	9,604	1,894
Venice	0	0	114	1,060	21	264	135	1,324
Westchester	0	0	124	1,053	186	216	310	1,269
Bel Air-Beverly Crest	0	0	3,719	3,408	0	2	3,719	3,410
Westwood	2	1	21	91	7	52	28.2	144
SAN FERNANDO VALLEY	11,944	1,701	11,194	17,493	1,845.5	2,981	24,983.5	22,175
Granada Hills-Knollwood	2,085	163	166	393	12	27	226.3	583
Encino-Tarzana	0	0	1,727	1,099	35	85	1,762	1,184
Canoga Park-Winnetka-Woodland Hills	1,052	166	2,052	2,931	189	325	3,293	3,422
Chatsworth-Porter Ranch	1,626	287	1,579	2,745	614	297	3,819	3.329
Mission Hills-Sepulveda-Panorama City	39	22	348	792	69	164	456	978
North Hollywood	0	0	155	461	74	332	229	793
Northridge	121	35	165	268	42	57	328	360
Reseda-West Van Nuys	0	0	205	466	68	126	273	592
Pacoima-Sun Valley	105	56	367	983	442	652	914	1,691
Sherman Oaks-Studio City	0	0	1,734	2,624	45.5	259	1,779.5	2,883
Van Nuys	0	0	112	516	69	239	181	755
Verdugo	4,238	669	945	1,222	30	136	5,213	2,027
Sylmar	740	103	718	934	119	123	1,577	1,160
Sunland-Tujunga-Shadow Hills-Lakeview Terrace	1,938	200	921	2,059	37	159	2,896	2,418
HARBOR AREA	0	0	446	1,962	1,834	3,411	2,280	5,373
Torrance-Gardena Strip	0	0	49	206	344	147	393	353
Wilmington-Harbor City	0	0	212	943	1,439	2,982	1,651	3,925
San Pedro	0	0	185	813	51	282	236	1,095
LOS ANGELES TOTAL	12,579.2	1,746	29,654	48,152	5,387.5	15,797	47,620.7	65,695

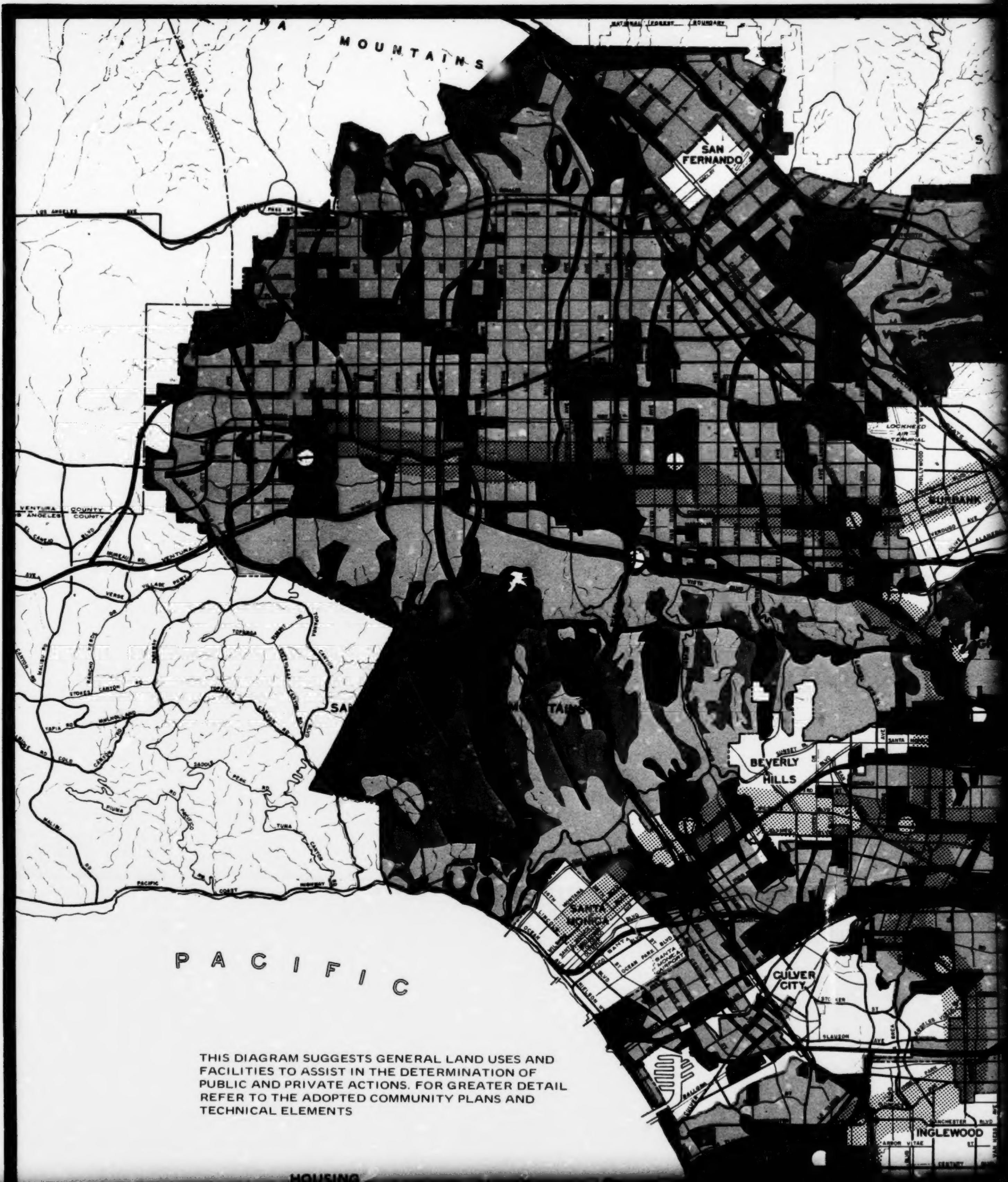
given in Figure GS-46. The long-range "Concept" portion of the General Plan serves as a generalized framework that includes broad policies for such matters as housing, land use, commerce, and transportation. The Citywide Plan is directed to the intermediate range, the next 20 years, and as such represents the initial stage in the achievement of the city envisioned in the Concept.

To evaluate the effects of the Facilities Plan, the existing land use is to be compared with the future land use. The General Plan, as a goal, identifies land use patterns for which the City is committed to provide wastewater treatment. The Facilities Plan thus should be consistent with the General Plan Concept. This Concept is characterized by centers having a high intensity of development and activity and low density suburban areas. Centers will include commercial, residential, appropriate industrial, recreational, cultural, educational, and other public facilities. Suburbs will be predominantly residential in character, but will include local business, public service facilities, schools, and parks. Centers of residences and businesses served by a mass rapid transit system form a major component of the Plan. Development of Centers depends primarily upon a restructuring of the City as new facilities are constructed and obsolete ones replaced.

The Concept General Plan serves as a guideline for the 35 planning areas composed of 70 communities tributary to the Los Angeles Wastewater Facilities. Only about one-half of the community plans and technical elements have been adopted as of mid-1976. Comparison of Figure GS-46, the future plan, with Figure GS-44, the existing land use, yields several striking observations.

1. There is to be a major curtailment of strip commercial and a concentration of commercial activities in the City Center. This goal is evident throughout the City, but is most noticeable in the San Fernando Valley. The process for this conversion is not spelled out, but such a concentration of commercial activities would represent a major revision in the City's land use policies.
2. Industry and employment centers are to expand where industry has started in the San Fernando Valley, notably between Topanga Canyon and DeSoto Avenues in the vacant and agricultural areas and further north in currently vacant and agricultural land along Nordhoff Street.
3. Low density and very low density housing is to be developed in the presently vacant northern border of the City, adjacent to the Los Angeles National Forest, and in the vacant areas of the Santa Monica Mountains.
4. Expansion is planned for the western end of Griffith Park and Elysian Park at the intersection of the Golden State and Pasadena Freeways.

A


MOUNTAINS
NATIONAL FOREST BOUNDARY
SAN FERNANDO
LOS ANGELES AVE
VENTURA COUNTY
LOS ANGELES COUNTY
LOCKHEED AIR TERMINAL
BURBANK
MOUNTAINS
BEVERLY HILLS
SANTA MONICA
SANTA MONICA AIRPORT
CULVER CITY
INGLEWOOD
PACIFIC

THIS DIAGRAM SUGGESTS GENERAL LAND USES AND FACILITIES TO ASSIST IN THE DETERMINATION OF PUBLIC AND PRIVATE ACTIONS. FOR GREATER DETAIL REFER TO THE ADOPTED COMMUNITY PLANS AND TECHNICAL ELEMENTS

HOUSING

B

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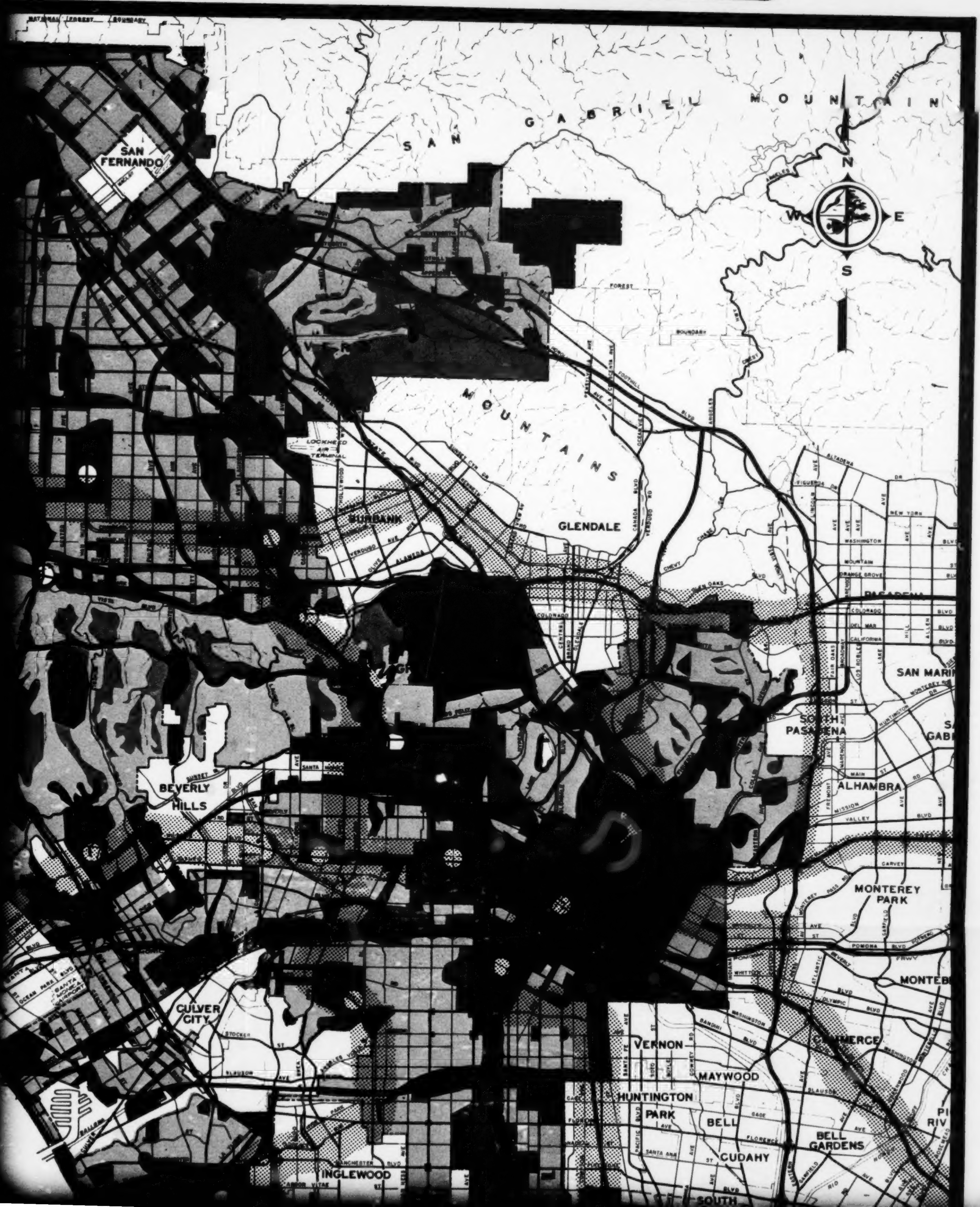
NATIONAL FOREST BOUNDARY
SAN GABRIEL MOUNTAIN
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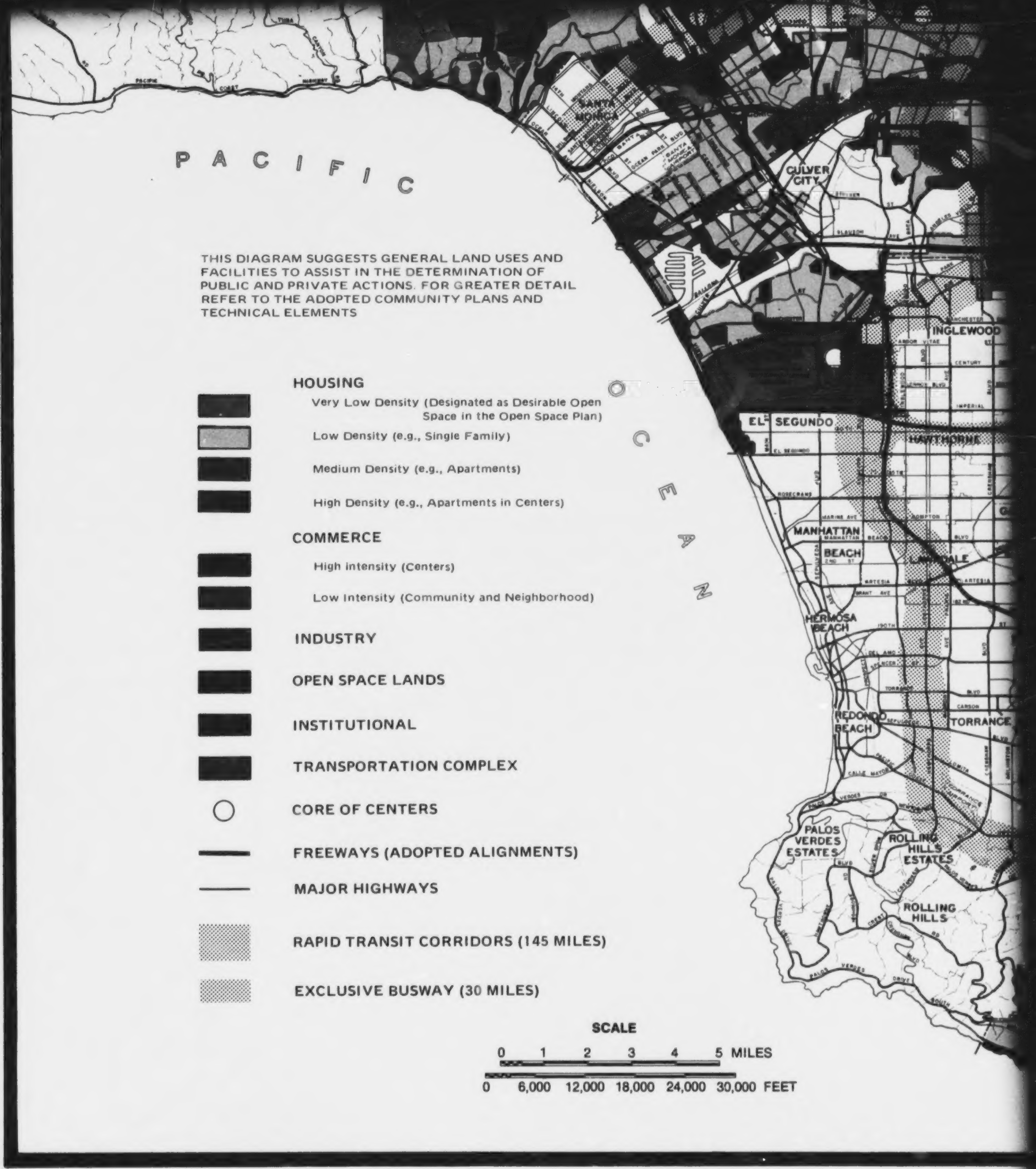
FOREST
BOUNDARY
SAN FERNANDO
MOUNTAINS
LOCKHEED AIR TERMINAL
BURBANK
GLENDALE
PASADENA
SAN MARI
SOUTH PASADENA
ALHAMBRA
BEVERLY HILLS
MONTEREY PARK
MONTEB
CULVER CITY
SANTA MONICA AIRPORT
VERNON
COMMERCE
MAYWOOD
HUNTINGTON PARK
BELL
CUDAHY
BELL GARDENS
INGLEWOOD
SOUTH

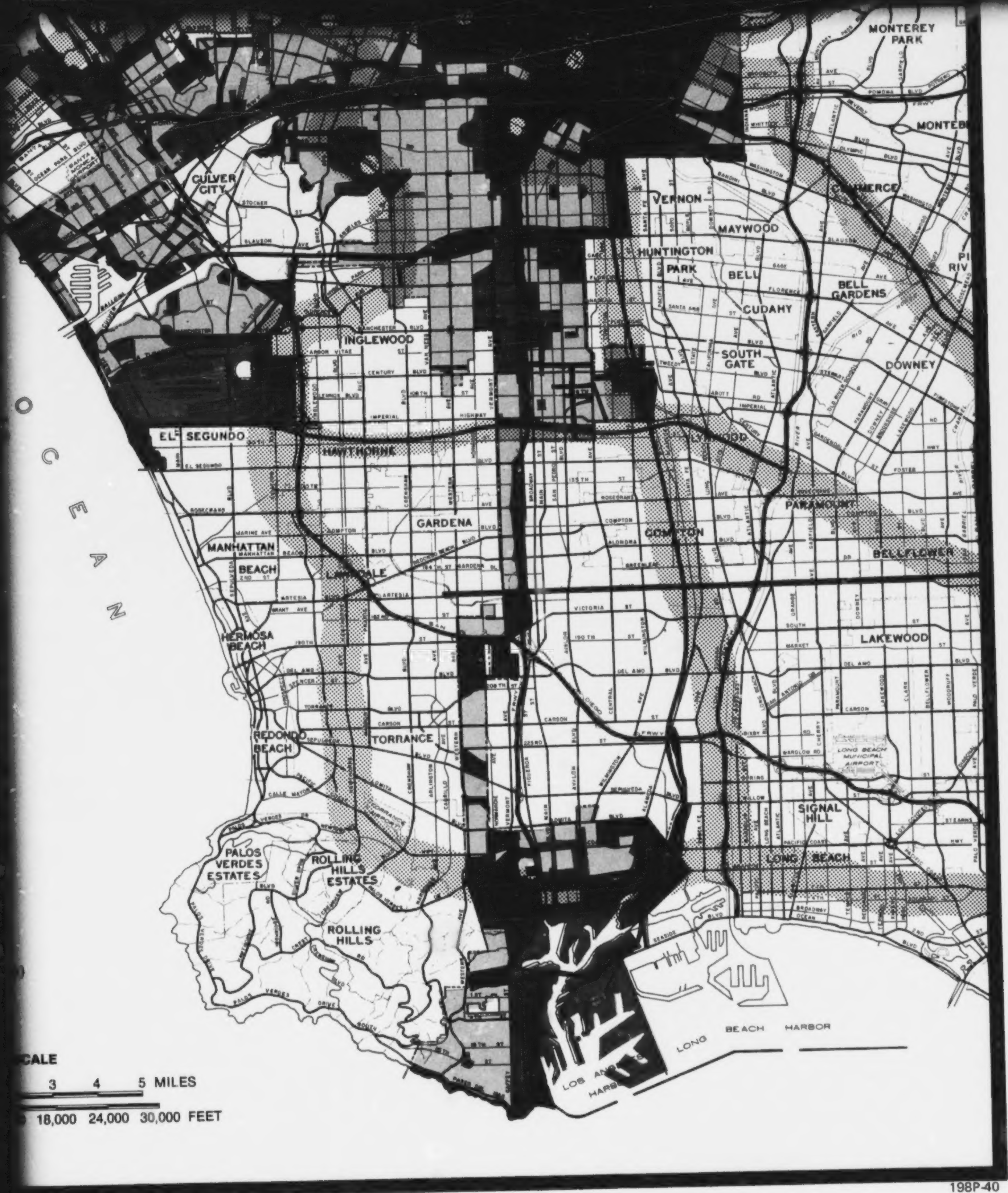


THIS DIAGRAM SUGGESTS GENERAL LAND USES AND FACILITIES TO ASSIST IN THE DETERMINATION OF PUBLIC AND PRIVATE ACTIONS. FOR GREATER DETAIL REFER TO THE ADOPTED COMMUNITY PLANS AND TECHNICAL ELEMENTS

PACIFIC OCEAN
HOUSING
Very Low Density (Designated as Desirable Open Space in the Open Space Plan)
Low Density (e.g., Single Family)
Medium Density (e.g., Apartments)
High Density (e.g., Apartments in Centers)
COMMERCE
High intensity (Centers)
Low Intensity (Community and Neighborhood)
INDUSTRY
OPEN SPACE LANDS
INSTITUTIONAL
TRANSPORTATION COMPLEX
CORE OF CENTERS
FREEWAYS (ADOPTED ALIGNMENTS)
MAJOR HIGHWAYS
RAPID TRANSIT CORRIDORS (145 MILES)
EXCLUSIVE BUSWAY (30 MILES)
SCALE
0 1 2 3 4 5 MILES
0 6,000 12,000 18,000 24,000 30,000 FEET
SANTA MONICA
CULVER CITY
INGLEWOOD
EL SEGUNDO
HAWTHORNE
MANHATTAN BEACH
LAWNDALE
HERMOSA BEACH
REDONDO BEACH
TORRANCE
PALOS VERDES ESTATES
ROLLING HILLS ESTATES
ROLLING HILLS

Figure GS-46. Concept General Plan guidelines.

C


MONTEREY PARK
MONTEBE
CULVER CITY
VERNON
MAYWOOD
COMMERCE
HUNTINGTON PARK
BELL
BELL GARDENS
CUDAHY
PI RIV
INGLEWOOD
SOUTH GATE
DOWNEY
EL SEGUNDO
HAWTHORNE
LYNWOOD
PARAMOUNT
GARDENA
COMPTON
MANHATTAN BEACH
BELLFLOWER
LAWNDALE
HERMOSA BEACH
LAKEWOOD
REDONDO BEACH
TORRANCE
LONG BEACH MUNICIPAL AIRPORT
SIGNAL HILL
PALOS VERDES ESTATES
ROLLING HILLS ESTATES
LONG BEACH
ROLLING HILLS
LONG BEACH HARBOR
LOS ANGELES HARBOR
O C E A N
SCALE
3 4 5 MILES
18,000 24,000 30,000 FEET

198P-40

D

5. Development of the Los Angeles River and its tributaries in the San Fernando Valley and south of Griffith Park as greenbelts is proposed.

6. High density residential development will be promoted around centers including the Wilshire Corridor and in the San Fernando Valley along Victory Boulevard.

7. Several new freeways will be developed.

c. Population Projections. Population growth constitutes demand for residential, commercial, and service activities, and wastewater treatment is one important service. Population projections for the City of Los Angeles have been proposed by several agencies involved in estimating future requirements for community services.

Population projections appropriate to the Facilities Plan are those that have been prepared for the City of Los Angeles by the California Department of Finance (DOF) and the Southern California Association of Governments (SCAG). For the Hyperion Service Area, these are given in Table GS-12. Each projection scenario reflects a particular combination of assumptions regarding birthrates, death rates, and net migration.

Table GS-12. Population estimates for the subareas within the Hyperion System used in the Facility Plan Projection.

SYSTEM SUBAREA	SUBAREA COMPONENT	1970 CENSUS	1975 CENSUS	PROJECTED					
				1980		1990		2000	
				DOF E-O 1974	SCAG-76 1975	DOF E-O 1974	SCAG-76 1975	DOF E-O 1974	SCAG-76 1975
San Fernando Valley	Sepulveda	643,000	665,674	619,061	678,379	608,060	724,081	616,521	758,533
	MOS-LCSFVRS Tunnel	339,414	339,085	322,467	346,785	309,702	365,999	309,053	383,405
LAGWRP	Los Angeles	5,752	6,225	5,813	6,129	5,512	6,228	5,320	6,313
	Glendale	103,271	101,040	97,242	103,483	94,176	107,618	92,036	112,154
	Burbank	87,716	88,198	84,952	87,921	79,260	87,685	77,094	87,553
	La Crescenta	21,800	22,640	21,408	23,479	20,448	25,157	20,100	26,823
HTP (direct)		1,887,647	1,830,567	1,745,273	1,846,230	1,662,564	1,931,457	1,607,978	1,988,962
Total Hyperion System		3,088,600	3,053,429	2,896,216	3,092,406	2,779,802	3,248,225	2,728,102	3,363,743

An additional constraint regarding population projections for the Facilities Plan of the City of Los Angeles is determination by the State Air Resources Board that the City is within an "air critical" area. This determination requires that particular care be taken to ensure that State Water Resources Control Board grants do not provide for growth with resultant further detrimental effects upon air quality. The State

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Air Resources Board requires that wherever an area is designated "air critical" only population projections based on birthrate "E" with an annual rate of 2.1 births per woman during her childbearing years and a net state inmigration of zero be used to project wastewater flows for funding grants. These E-0 birthrate projections, prepared by the California State Department of Finance and the SCAG-76 projection (which is based on DOF D-100 series projections, or baseline state population), have been used in both the Facilities Plan and the EIS. Strict adherence is required in planning population growth restrictions to ensure that the goals of the City as a whole are reflected in all planning efforts.

Although the two projections do not differ significantly in the distribution of population (each forecast about 23 percent in the Sepulveda subcomponent area by 2000 and 59 percent in the HTP direct subcomponent area), they differ dramatically in total population and the direction of growth. DOF E-0 forecasts a net loss of population from 1970 through 2000 while SCAG-76 forecasts growth. In 1980, DOF forecasts are 94 percent of SCAG forecasts; by 1990, they are 85 percent; and by 2000, only 81 percent. DOF forecasts the HTP service area to decline by 12 percent over 30 years, while SCAG forecasts a 9 percent increase. That the two data sets do not differ in their distributions is a function of how the distributions were prepared. That they do differ in the total future populations is a function of the underlying assumptions used in the projections.

d. Housing. The mechanism by which demographic pressure is transformed into housing market demands is economic. Area employment, real income and the relative prices of different types of dwellings as well as all other commodities will condition the demand side of the housing market.

Population density and housing type are intimately related and together greatly influence demands for wastewater treatment facilities. The availability of these and other necessary services and utilities, in turn, affects the future of housing types and locations.

The decade of the 1960s marked a period of intensive apartment construction and signaled an end to expansion of the single family residential neighborhood. From a plateau of 46 percent in 1960, the percentage of owner-occupied units dropped to 40 percent in 1970. The large increase in apartments and in renters was due principally to the impact of the San Fernando Valley, where multiple family units almost tripled in number.

Since multiple units as a proportion of the total housing stock have been on the increase, their share has risen from 24.3 percent to 36.7 percent of the housing stock.

Table GS-13 reveals that residential land use density has increased in Los Angeles and most of the contract cities.

Table GS-13. Residential land densities—Los Angeles and contract communities (density index).*

CITY	1970	1976	% D 1970-1976
Los Angeles	5.034	5.302	5.32
Beverly Hills	6.672	6.814	2.21
Burbank	9.957	10.158	2.02
Culver City	10.133	12.761	25.93
El Segundo	10.839	11.131	3.82
Glendale	3.79	3.997	5.46
San Fernando	7.096	7.051	-.06
Santa Monica	15.51	17.097	10.23

*These densities are based on total housing units divided into acreage zoned for single and multiple residential use.

e. Transportation. The widely distributed employment centers, strip commercial, large areas of low density single family tract developments, and distances required for every community activity combine to place emphasis upon the private automobile as the dominant means of transportation.

The transportation system in the City of Los Angeles developed from the electirc "Red Cars" of the 1920s to nearly sole reliance on the private automobile today. The Pacific Electric Lines established all major areas for future development and interconnected several of the presently planned urban centers. The low density and spread out nature of the City of Los Angeles has stimulated one of the most comprehensive networks of streets, highways, and freeways in the world. This comprehensive system is an efficient mover of vehicular traffic, particularly during off-peak hours; however, the system efficiency drops considerably during peak trip periods.

The close interrelationship between private transportation as mobile sources of pollution affecting air quality makes transportation planning for the City a complex task. The peak traffic times are during commute periods, but all employment related traffic trips, including both commute trips and trips during work, account for less than 25 percent of the total trips in the area. Table GS-14 gives the trip-purpose distribution for the Los Angeles Basin and identifies nearly 50 percent of the total trips as being home to shopping, school, recreation, and other activities.

Thus, a transportation plan designed to decrease home/work commute trips and peak congestion would only be able to affect 17.3 percent of

Table GS-14. Trip-purpose distribution (Southern California Association of Governments, 1975).

TRIP TYPE	PERCENT OF TOTAL WEEKDAY TRIPS
Home-Work	17.3
Home-Shopping	13.9
Home-Other	35.6
Work-Other	7.1
Other-Other	26.1
TOTAL	100.0

the total trips generated. This creates the difficulty that a rapid transportation system in Los Angeles, designed to alleviate a figure as high as 10 percent of the commute trips through transfer from the private automobile to other transportation would affect less than 2 percent of the total trips in the City of Los Angeles and would have little effect upon air quality. For any significant benefit to the City's air quality both the work and nonwork traffic will need to be enticed away from pollution generating private automobiles.

f. Recreation. Existing recreation opportunities and identified needs relate to the potential uses of reclaimed water that could be generated by future wastewater treatment facilities. The role of wastewater treatment may well be changing in this decade of the 1970s from an element having a deleterious effect upon recreation during the 1940s and 1950s with beaches quarantined due to high concentrations of pathogens as a result of Hyperion effluent to a positive element promoting recreation, both water and non-water related, through the treating of wastewater to such a degree that it can be reused for irrigation and contact recreation.

A major source of recreational opportunities in the Los Angeles region is the vast beach system. This system not only attracts many tourists, but is a major source of recreational enjoyment for the local population. The sludge and treated wastewater from the City's wastewater system at Hyperion is presently discharged offshore from the beaches.

Beaches are categorized as regional in size for service area purposes. Some of the beaches are owned by the state and county. On 1 July 1975, operational responsibility for the beaches was assumed by Los Angeles County. The largest beach is Dockweiler Beach with 274 acres near the Los Angeles International Airport, and the Hyperion Treatment Plant. In 1975, more than 49 million people visited beaches operated by the County. By 1976, this number had surpassed 57 million.

Historically, the quality of beach and water recreation has been affected by the ocean discharge of wastewater. In 1943, the State Department of Public Health quarantined approximtely 10 miles of beach, from Hermosa Beach on the south to Venice on the north. Later in the same year, the state brought suit against the City which resulted in a Superior Court Order to construct a treatment plant that would permanently eliminate the nuisance condition. Successive connective efforts resulted in the modernization of the Hyperion Treatment Plant at Playa del Rey.

Again, in the 1940s and 1950s, there were closures or threatened closures of area beaches as the result of the Hyperion effluent. Completion of the 5- and 7-mile outfalls effectively halted the Hyperion effluent which caused beach closures. Presently, the beaches meet the water quality criteria of the Regional Water Quality Control Board and the existence of these wastewater treatment plants and their attendant ocean outfalls exercises little, if any, constraint on beach related activities.

g. Utilities and Services. Public and private agencies alone or in combination provide a community with a variety of services in utilities ranging from amenities to basic requirements. Examples include cultural enrichment, police and fire protection, water and power, health care, education, and communications.

The relationship between some services and wastewater facilities is tangential. Assuming economic growth is sufficient to produce population growth, individual residential choices may be partially conditioned by available community services. This is particularly true for education services and less true for police and fire protection and health care where public information on the quality of service tends to be limited. Utilities that are directly related to wastewater treatment are reviewed in this section.

(1) SOLID WASTE FACILITIES. Solid waste is directly related to wastewater facilities as solids removed from treated wastewater could constitute significant solid waste load in the future. Although, at the present time, only sludge from the Terminal Island Treatment Plant is being hauled to a landfill, in the future most, if not all, sludge will be trucked to landfills because of the requirements to cease ocean disposal of sludge by 1978. A study is under way to examine sludge disposal methods suitable for major metropolitan areas and to develop a Basinwide Wastewater Solids Management Program. The participants in the study are the Los Angeles County Sanitation Districts, City of Los Angeles, Orange County Sanitation Districts, U.S. Environmental Protection Agency, and the State of California. The results of this study could have a decided impact on the County's Solid Waste Plan. The study is tentatively expected to be completed by December 1978.

Existing water pollution abatement programs are forcing an increasing volume of hazardous wastes to be diverted to the land instead of to the sewage system for ultimate disposal. The County Sanitation Districts of Los Angeles County and the City of Los Angeles, Bureau of Sanitation, confronted with the problem of improving treatment plant effluent quality to conform with the higher standards of federal and state laws, have placed more stringent quality requirements on industrial wastewater discharges. Many industries utilizing the sewerage system have been faced with the options of installing an industrial wastewater treatment plant or finding another means of disposing of their waste. The sludges and residues produced by treatment processes are generally quite concentrated and may be hazardous in nature. Liquid and semiliquid wastes generated in treatment processes are commonly deposited in sanitary landfills.

(2) WATER SUPPLY. The development of the City of Los Angeles has been dependent, to a great extent, on its ability to acquire and maintain sufficient water supplies to support its large concentration of people. Early importation of water in the Los Angeles area was made necessary by the inadequacy of local water resources to respond to a rapidly increasing population. During this early growth period, the absence of adequate surface water supplies prompted the investigation and development of groundwater sources. Subsequently, reliable and efficient water supplies attracted industrial and agricultural interests which resulted in the overdraft of subsurface supplies and, in some locations, created seawater intrusion problems. Presently, some areas of the City are dependent on local groundwater sources; however, most of the water supply is from great distances with the main sources being the Owens Valley area, the Colorado River, and to an increasing extent, the State Water Project (Feather River).

h. Cultural Resources. Historical, paleontological, and archaeological sites and structures are numerous throughout the Los Angeles wastewater service area. Figure GS-47 shows the historical sites. Paleontological and archaeological maps are presented in the main text.

Cultural resources near potential project construction sites are discussed in Chapter II, but no known sites are located such that any direct impacts would be expected.

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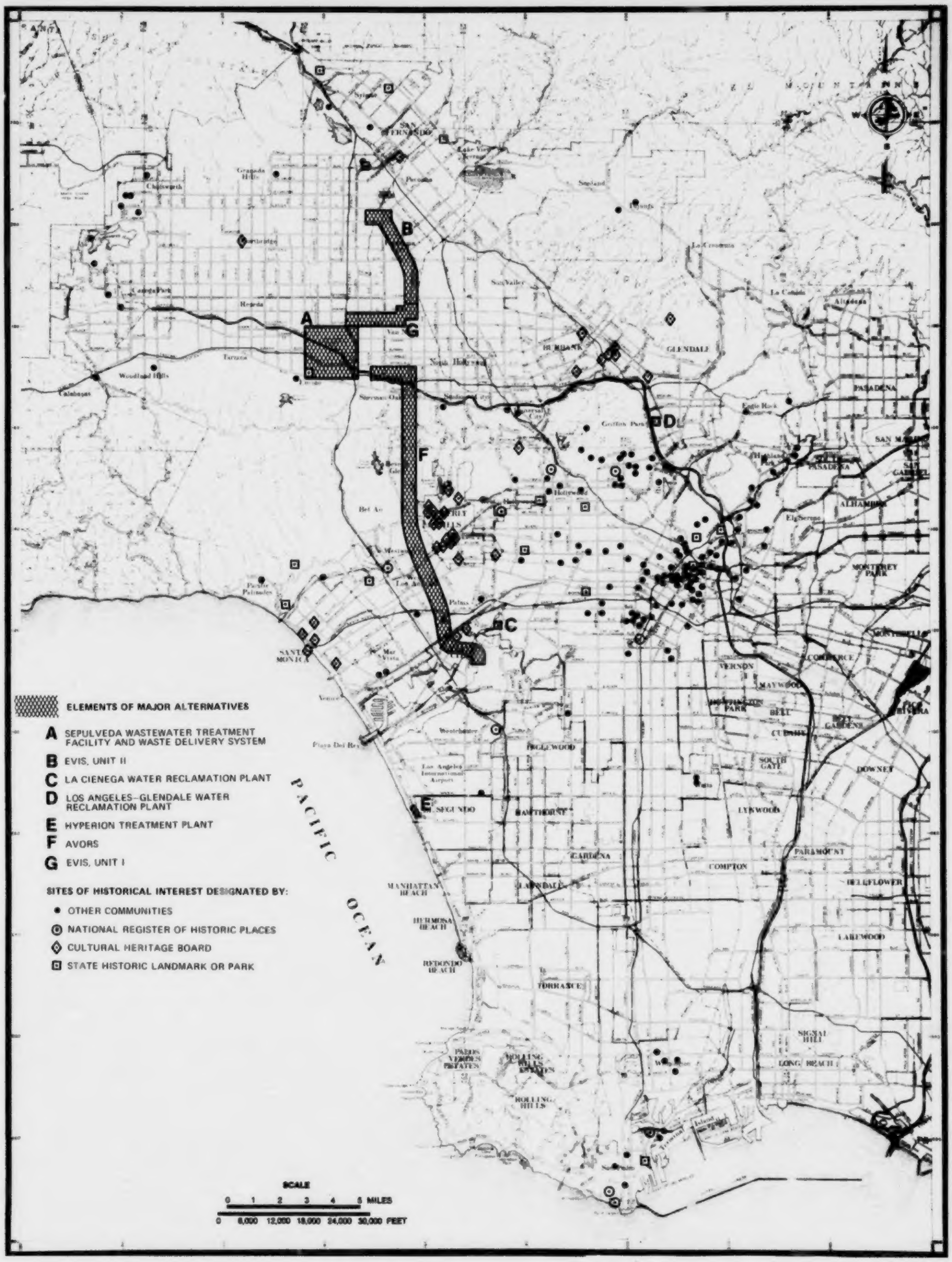
ELEMENTS OF MAJOR ALTERNATIVES
A SEPULVEDA WASTEWATER TREATMENT FACILITY AND WASTE DELIVERY SYSTEM
B EVIS, UNIT II
C LA CIENEGA WATER RECLAMATION PLANT
D LOS ANGELES–GLENDALE WATER RECLAMATION PLANT
E HYPERION TREATMENT PLANT
F AVORS
G EVIS, UNIT I
SITES OF HISTORICAL INTEREST DESIGNATED BY:
● OTHER COMMUNITIES
◎ NATIONAL REGISTER OF HISTORIC PLACES
◇ CULTURAL HERITAGE BOARD
▣ STATE HISTORIC LANDMARK OR PARK
PACIFIC OCEAN
SCALE
0 1 2 3 4 5 MILES
0 6,000 12,000 18,000 24,000 30,000 FEET
SAN FERNANDO
GLENDALE
BURBANK
PASADENA
SAN MARINO
ALHAMBRA
MONTEREY PARK
SANTA MONICA
VERNON
MAYWOOD
HUNTINGTON PARK
BELL
CUDAHY
SOUTH GATE
BELL GARDENS
COMMERCE
MONTEBELLO
DOWNEY
LYNWOOD
INGLEWOOD
EL SEGUNDO
HAWTHORNE
GARDENA
LAWNDALE
COMPTON
PARAMOUNT
BELLFLOWER
LAKEWOOD
MANHATTAN BEACH
HERMOSA BEACH
REDONDO BEACH
TORRANCE
SIGNAL HILL
LONG BEACH
PALOS VERDES ESTATES
ROLLING HILLS ESTATES
ROLLING HILLS

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Figure GS-47. Historical sites in the City of Los Angeles.

D. alternative projects

GS-113

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D. ALTERNATIVE PROJECTS

1. BRIEF DESCRIPTION

Alternatives presented in the Facilities Plan are designed to eliminate deficiences and meet the following criteria:

- Discontinuation of sludge disposal to the ocean. (This is a pre-Facilities Plan project addressed by a separate project report.)
- Provision of full secondary treatment of effluents discharged to receiving waters.
- Provision of capacity adequate to serve the expected population projected for the year 2000.
- Relief of sewage overflow problems.

The Facilities Plan discusses 17 separate alternatives in categories identified by letter symbols (A, B, etc.). In addition, one alternative ("X alternative") not described in the Facilities Plan is addressed in the EIS. Table GS-15 summarizes the alternatives receiving initial consideration.

In general, the alternatives considered fall into five basic categories:

- "No Project" alternatives which fail to meet state and federal requirements for sludge disposal and secondary treatment (A series).
- Inland/Coastal treatment plant projects which include additional waste treatment facilities at inland locations as well as coastal treatment through modernization at Hyperion (B and F series).
- Coastal treatment projects which include increased capacity to the San Fernando Valley through interceptors or some other means excluding inland treatment (C and D series).
- Treatment projects which do not include hydraulic relief to the San Fernando Valley, but do meet ocean discharge requirements (CX only). This is not a viable alternative but is proposed for implementation to form a basis for analyzing secondary air impacts of population increases in the San Fernando Valley.
- Full reclamation projects which include a new water reclamation plant in the La Cienega area (E2).

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Table GS-15. Alternative projects receiving initial consideration.

	PHYSICAL PLANT CHANGES								DESIGN CRITERIA			
EVALUATION CRITERIA ALTERNATIVE	HYPERION MODERNIZATION	HYPERION EXPANSION	LA-GLENDALE EXPANSION	SEPULVEDA CONSTRUCTION	SEPULVEDA EXPANSION	EVIS	AVORS TUNNEL	LA CIENEGA	STOPS OCEAN SLUDGE DISPOSAL	PROVIDES FULL SECONDARY TREATMENT	PROVIDES FOR SCAG-76 POPULATION PROJECTIONS	RELIEVES SEWER OVERFLOWS
• A-1 No-Project	Yes	No	No	No	-	No	No	No	No	No	No	No
• A-2a with inland treatment and EVIS at Sepulveda	No	No	No	Yes	Yes	Yes	No	No	No	No	Yes	Yes
• A-2b with additional relief sewer (AVORS)	No	No	No	No	-	No	Yes	No	No	No	Yes	No
• B-1 inland treatment at Sepulveda with EVIS and Hyperion	Yes	Yes	No	Yes	No	Yes	No	No	Yes	Yes	Yes	Yes
• B-2 Modular inland expansion at Sepulveda and LA-Glendale without Hyperion modernization	No	No	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes
• B-3 Modular inland expansion at Sepulveda with Hyperion modernization	Yes	No	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes
• B-4 Modular inland expansion at Sepulveda and LA-Glendale with Hyperion modernization	Yes	No	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes
• B-5 Small reclamation plants	Yes	No	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes
• C-1 retention Basins	Yes	Yes	No	No	No	Opt.	No	No	Yes	Yes	Yes	Yes
• C-2 Pumped Flows	Yes	Yes	No	No	No	Opt.	Opt.	No	Yes	Yes	Yes	Yes
• C-3 Construction of interceptor sewers	Yes	Yes	No	No	No	Opt.	Yes	No	Yes	Yes	Yes	Yes
• D Effluent evaporation	Yes	Yes	Opt.	Opt.	Opt.	Opt.	Opt.	No	Yes	Yes	Yes	Some
• E Maximum Reclamation	Yes	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
• F-1 Combined treatment systems with Los Angeles County SAND (interconnection of interceptors)	Yes	Yes	Yes	Yes	Opt.	Opt.	No	No	Yes	Yes	Yes	Yes
• F-2 Combined treatment system with Las Virgenes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes
• G Treatment of storm runoff	Storage and treatment of storm runoff is not comparable with above projects and would require basinwide systems.											
• H Improved management	To be incorporated into the above alternatives.											

An initial screening of alternatives is presented in the Facilities Plan and summarized in Chapter VII of the EIS. On the basis of cost effectiveness screening, the Facilities Plan selected a single B alternative, a single E alternative, and a single C alternative for further consideration. Alternative A1 is included for further analysis because of the federal requirements to consider "No Project" as an alternative.

The final list of alternatives selected for consideration in the EIS is A1, B4C, C3, and E2. Major structural features that are combined in various ways to comprise the alternatives are explained briefly below:

- Hyperion or HTP refers to plants of various sizes that would provide secondary treatment, and be located at the site of the existing Hyperion Treatment Plant on the coast south of the Los Angeles International Airport.
- Interim Sludge Processing and Disposal refers to the proposed program for dewatering and landfilling sludge. The processing facilities are to be located at Hyperion.
- Sepulveda is a 40-mgd wastewater treatment plant proposed for construction in the San Fernando Valley. This plant would be located in the Sepulveda Flood Control Basin, and would provide tertiary treatment of the wastewater. It would be expanded in increments to an ultimate capacity of approximately 85 mgd.
- LA-Glendale is an existing 20-mgd water reclamation plant near the southeasternmost part of the San Fernando Valley.
- Modular Expansion of Sepulveda or LA-Glendale refers to the capacity of these facilities in various multiples of 5 mgd, depending on the alternative.
- La Cienega is a large additional water reclamation plant currently being investigated for the La Cienega area near where the NOS-LCSFVRS and the NCOS-NOS systems come together. It would be built at approximately 75 mgd capacity.
- EVIS is the proposed Wast Valley Interceptor Sewer to be built in two units. All alternatives that include Sepulveda also include EVIS, which would intercept and divert flows from areas in the San Fernando Valley that would otherwise not be tributary to Sepulveda.
- AVORS (tunnel) is a proposed new relief sewer (an extension of the Additional Valley Outfall Relief Sewer) which would flow southward through the Santa Monica Mountains and subsequently eastward to join an existing interceptor sewer (NCOS) tributary to the Hyperion Treatment Plant. This sewer would carry flows generated in the western end of the San Fernando Valley.
- Woodman Avenue Relief Sewer would be built only with AVORS to increase the service area tributary to the additional tunnel capacity.

- Griffith Park Reclaimed Water Delivery System is an irrigation project for providing tertiary treated water from LA-Glendale to Griffith Park. This could be constructed with or without any other project elements.
- Sepulveda Dam Recreation Area Reclaimed Water Delivery System would be built if Sepulveda were built and would make tertiary treated water available for irrigation.

Table GS-16 shows the construction and operation dates proposed for structural elements of each of the five alternatives receiving final consideration.

a. No Project (A1). The only changes to existing conditions that would result from the No Project alternative are modernization of Hyperion treatment facilities and an increase in secondary capacity of Hyperion to provide secondary treatment up to 200 mgd. This would involve removal and replacement of existing secondary facilities with a pure oxygen secondary system. No new construction would be undertaken at any other site, and no change would be implemented in sludge disposal procedures. (The Interim Sludge Processing and Disposal Program has not been included in this No Project discussion but can be implemented with or without any other project elements.) Only minor repairs and maintenance would be made as necessary to maintain existing systems.

b. Inland-Coastal Split of Treatment Capacity (B4C). The City's preferred alternative for providing full secondary treatment is alternative B4C. Major elements of this alternative include provision of 307 mgd secondary treatment at Hyperion, including replacement of existing secondary with a pure oxygen secondary, and an initial 40 mgd tertiary treatment at Sepulveda followed by 30 mgd and 15 mgd additions to Sepulveda and a 10 mgd addition to the existing 20 mgd LA-Glendale Water Reclamation Plant. Sludge removal and disposal for all three treatment facilities would be provided at Hyperion. In addition to the three major treatment facilities recommended under this alternative, the East Valley Interceptor Sewer would be constructed in two units to increase the service area tributary to the Sepulveda Water Reclamation Plant. Reclaimed water made available by the Sepulveda and LA-Glendale Plants would be distributed for irrigation purposes through the two proposed systems: Sepulveda Dam Recreation Area Reclaimed Water Delivery System and the Griffith Park Reclaimed Water Delivery System. Figure GS-48 shows the major elements of alternative B4C.

c. Coastal Capacity with Relief Sewer for the San Fernando Valley (C3). Under alternative C3, 397 mgd of secondary treatment would be provided at the Hyperion Treatment Plant. The existing secondary systems would be replaced with a pure oxygen secondary system. The only other treatment facility would be the existing 20 mgd LA-Glendale Plant. The Additional

Table GS-16. Summary of construction and O&M dates for elements of major alternatives.

PROJECT	NO PROJECT		B4C		C3		CX		E2	
	CONSTR.	O&M	CONSTR.	O&M	CONSTR.	O&M	CONSTR.	O&M	CONSTR.	O&M
HTP Secondary Conversion (307 mgd)	-	-	77-82	82-2000	-	-	-	-	78-82	82-2000
HTP Flexibility to Lower Capacity	-	-	-	-	-	-	-	-	1977	82-2000
HTP Secondary Conversion (397 mgd)	-	-	-	-	77-82	72-2000	-	-	-	-
HTP Secondary Conversion (387 mgd)	-	-	-	-	-	-	77-82	82-2000	-	-
HTP Modernization (+ up to 200 mgd secondary)	77-82	82-2000	-	-	-	-	-	-	-	-
HTP Interim Sludge Processing and Disposal	-	-	1978-80	80-97	1978-80	80-97	1978-80	80-97	1978-80	80-97
Sepulveda Plant (40 mgd)	-	-	77-80	79-2000	-	-	-	-	77-80	79-2000
Sepulveda Plant (30 mgd Addition)	-	-	79-80	81-2000	-	-	-	-	79-80	81-2000
Sepulveda Plant (15 mgd Addition)	-	-	92-93	94-2000	-	-	-	-	92-93	94-2000
La Cienega Water Reclamation Plant (75 mgd)	-	-	-	-	-	-	-	-	82-85	86-2000
East Valley Interceptor Sewer										
EVIS I	-	-	78-79	80-2000	-	-	-	-	78-79	80-2000
EVIS II	-	-	82-83	84-2000	-	-	-	-	82-83	84-2000
Los Angeles-Glendale (10 mgd Addition)	-	-	88-89	89-2000	-	-	88-89	89-2000	88-89	89-2000
AVORS (85 cfs)	-	-	-	-	77-79	80-2000	-	-	-	-
Griffith Park Reclaimed Water Delivery System (9 mgd)	-	-	77-78	79-2000	77-78	79-2000	77-78	79-2000	77-78	79-2000
Sepulveda Dam Recreation Area Reclaimed Water Delivery System (9 mgd)	-	-	1980	81-2000	-	-	-	-	1980	81-2000
Woodman Ave. Relief Sewer (54 cfs)	-	-	-	-	82-83	84-2000	-	-	-	-
Total Capacity (Secondary or Better)		220		422		417		417		422

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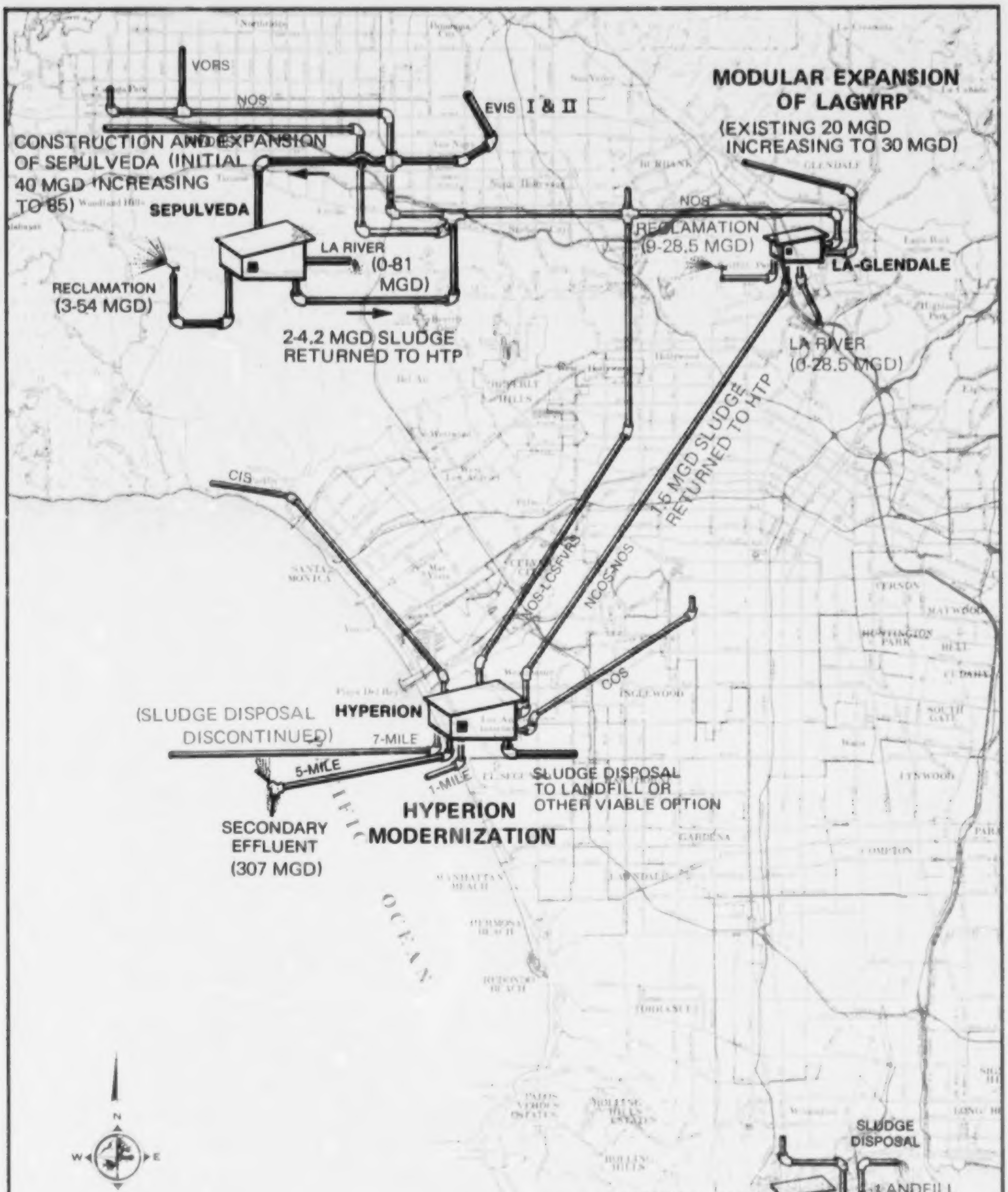
VORS
NOS
EVIS I & II
MODULAR EXPANSION OF LAGWRP
(EXISTING 20 MGD INCREASING TO 30 MGD)
CONSTRUCTION AND EXPANSION OF SEPULVEDA (INITIAL 40 MGD INCREASING TO 85)*
SEPULVEDA
LA RIVER (0-81 MGD)
RECLAMATION (3-54 MGD)
2-4.2 MGD SLUDGE RETURNED TO HTP
NOS
RECLAMATION (9-28.5 MGD)
LA-GLENDALE
LA RIVER (0-28.5 MGD)
1.5 MGD SLUDGE RETURNED TO HTP
CIS
NOS-LCSFVRS
NCOS-NOS
COS
(SLUDGE DISPOSAL DISCONTINUED)
HYPERION
7-MILE
5-MILE
1-MILE
SLUDGE DISPOSAL TO LANDFILL OR OTHER VIABLE OPTION
HYPERION MODERNIZATION
SECONDARY EFFLUENT (307 MGD)
OCEAN
N
S
E
W
SLUDGE DISPOSAL
LANDFILL
TERMINAL ISLAND
SECONDARY EFFLUENT
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*The City feels a change in Health Department regulations may allow groundwater recharge of Sepulveda effluent up to 45 mgd. It is felt, however, this is unlikely.

Figure GS-48. Major elements of alternative B4C.

Valley Outfall Relief Sewer, or AVORS, would be constructed to a capacity of 85 cfs to transport sewage wastes from the San Fernando Valley to the Hyperion Treatment Plant. The Woodman Avenue Relief Sewer, along the same alignment as the proposed EVIS Unit II, would be necessary to enlarge the service area which would be tributary to the AVORS addition. Alternative C3 also includes interim sludge processing at Hyperion Treatment Plant and operation of the Griffith Park Reclaimed Water Delivery System. Figure GS-49 shows the major elements of alternative C3.

d. Coastal Capacity without Hydraulic Relief for the San Fernando Valley (CX). Alternative CX would fulfill federal and state requirements for providing full secondary treatment of effluents discharged to receiving waters and for terminating sludge disposal to the ocean. However, the alternative does not provide for hydraulic relief of the San Fernando Valley adequate to meet the needs generated by anticipated population growth after the 1980s and therefore does not meet the City of Los Angeles' criteria for planning. Alternative CX is discussed in this EIS to determine the impact on air quality of population increases in the San Fernando Valley.

Alternative CX would provide most of the additional secondary treatment capacity needed in the project area at the Hyperion Treatment Plant. Also a 10 mgd addition would be built on to the existing 20 mgd LA-Glendale Water Reclamation Plant. This would provide limited hydraulic relief to the San Fernando Valley by increasing upstream treatment capacity. No other projects to relieve hydraulic constraints in the San Fernando Valley are proposed under this alternative. Neither the Sepulveda Water Reclamation Plant nor the AVORS would be constructed. The Griffith Park Reclaimed Water Delivery System is proposed as part of this project but could be eliminated without affecting other project elements. Alternative CX is evaluated in order to assess the secondary impacts on air quality of growth versus no growth in the San Fernando Valley.

e. Inland-Coastal Split with Maximum Potential for Reclamation (E2). Alternative E2 includes project elements that would allow a maximum amount of water reclamation. Project elements are similar to those proposed for alternative B4C with the major exceptions that a 75 mgd La Cienega Water Reclamation Plant would be operational in 1986 and that the initial 307 mgd unit at Hyperion would be modified after 1986 to treat 232 mgd with 50 mgd receiving advanced treatment for reclamation. The remaining secondary system would be converted to fine bubble aeralia. Provisions for including this flexibility in the 307 mgd Hyperion Unit would be complete in 1977.

Proposals for constructing and adding to the Sepulveda Water Reclamation Plant and the Los Angeles-Glendale Water Reclamation Plant are the same as described for alternative B4C. Other common project elements include the Interim Sludge Processing and Disposal Program, the East Valley Interceptor Sewer Units I and II, the Griffith Park Reclaimed Water Delivery System, and the Sepulveda Dam Recreation Area Reclaimed Water Delivery System. As with other alternatives, implementation of the Interim

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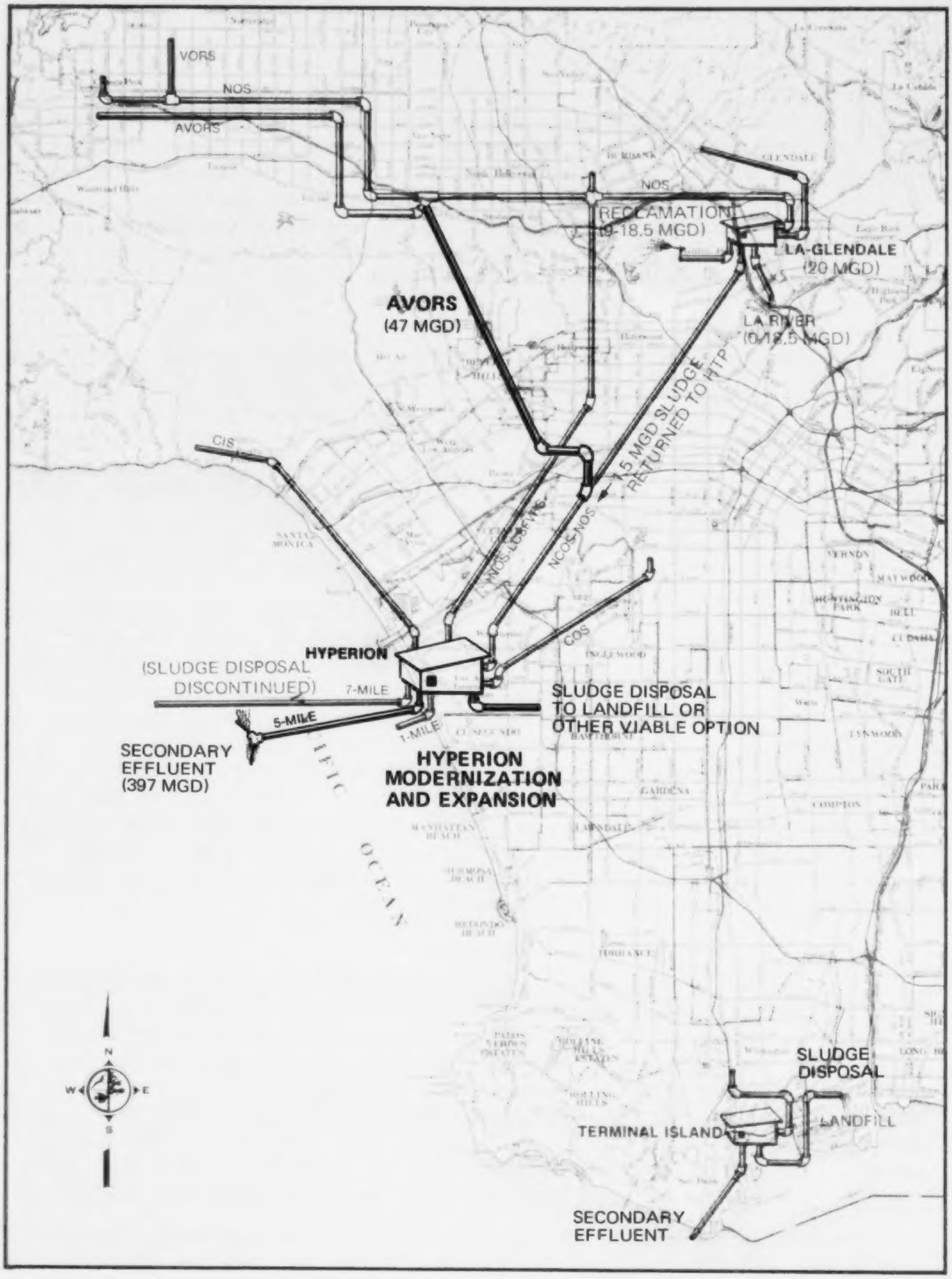
VORS
NOS
AVORS
NOS
RECLAMATION
(9-18.5 MGD)
LA-GLENDALE
(20 MGD)
AVORS
(47 MGD)
LA RIVER
(0/18.5 MGD)
1.5 MGD SLUDGE RETURNED TO HTP
CIS
NCOS-NOS
COS
HYPERION
(SLUDGE DISPOSAL DISCONTINUED)
7-MILE
5-MILE
1-MILE
SLUDGE DISPOSAL TO LANDFILL OR OTHER VIABLE OPTION
SECONDARY EFFLUENT (397 MGD)
HYPERION MODERNIZATION AND EXPANSION
OCEAN
SANTA MONICA
INGLEWOOD
VERNON
MAYWOOD
HUNTINGTON PARK
BELL
SOUTH GATE
LYNWOOD
COMPTON
GARDENA
HAWTHORNE
EL SEGUNDO
MANHATTAN BEACH
HERMOSA BEACH
REDONDO BEACH
TORRANCE
GLENDALE
BURBANK
N
S
E
W
SLUDGE DISPOSAL
LANDFILL
TERMINAL ISLAND
SECONDARY EFFLUENT

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Figure GS-49. Major elements of alternative C3.

Sludge Program and operation of the Griffith Park Reclaimed Water Delivery System are independent of other project elements. This project involves an apparent delay in implementation of full secondary treatment and, therefore, is considered not viable. Figure GS-50 shows the major elements of alternative E2.

2. COST ANALYSIS

A full review of project costs is contained in the main text. Table GS-17 summarizes total costs of the main alternatives considered. (Costs of each project element are given in Tables GS-23 and GS-24.)

Estimated project costs are subject to change following review of the Draft Facilities Plan. Some of the design uncertainties potentially affecting cost estimates include questions regarding availability of land at the Hyperion site. The costs for alternative C3 include the very high costs of placing a retaining wall behind the facility, apparently increasing the costs by $60 million. At question is whether, in lieu of the retaining wall, it would be possible to place the additional facilities on other sites at Hyperion or in the adjacent industrial complexes. This issue is further discussed in the main text and the Facilities Plan.

The Facilities Plan notes that a 150 mgd secondary facility (or tertiary) could be constructed in an undeveloped parcel of Standard Oil land for approximately $54 million. However, this is not a viable possibility because the land is not available to the City of Los Angeles.

The proposed Sepulveda facility has already been designed. Because of NPDES changes in discharge criteria; design revisions will possibly be needed to meet higher discharge requirements. The operational LA-Glendale facility also will have to meet these requirements.

All of the alternatives developed above include the removal and replacement of the existing secondary treatment facilities. These facilities are capable of treating flows in the neighborhood of 150 mgd, although they are presently operated at 100 mgd so as to attain a very high quality effluent (much higher than secondary requirements). Aside from the question of whether it is cost-effective to remove these facilities, there remains the issue of the impact on the marine environment of discontinuing for a period of years, the secondary treatment. The SWRCB, acting on appeal from the City, determined from a cost-effective basis that the City should plan for removal of the existing secondary facilities on 17 February 1977. EPA has not yet reached a final determination on the environmental consequences. LA-Glendale expansion to 30 mgd with alternative C3 apparently was not pursued in the Facilities Plan.

The money earned by selling reclaimed water has not been included in the cost-benefit analysis for alternative E2. This would tend to lower the costs of the reclamation alternative. Appendix F to the Facilities Plan compares potential costs and impacts of producing equal

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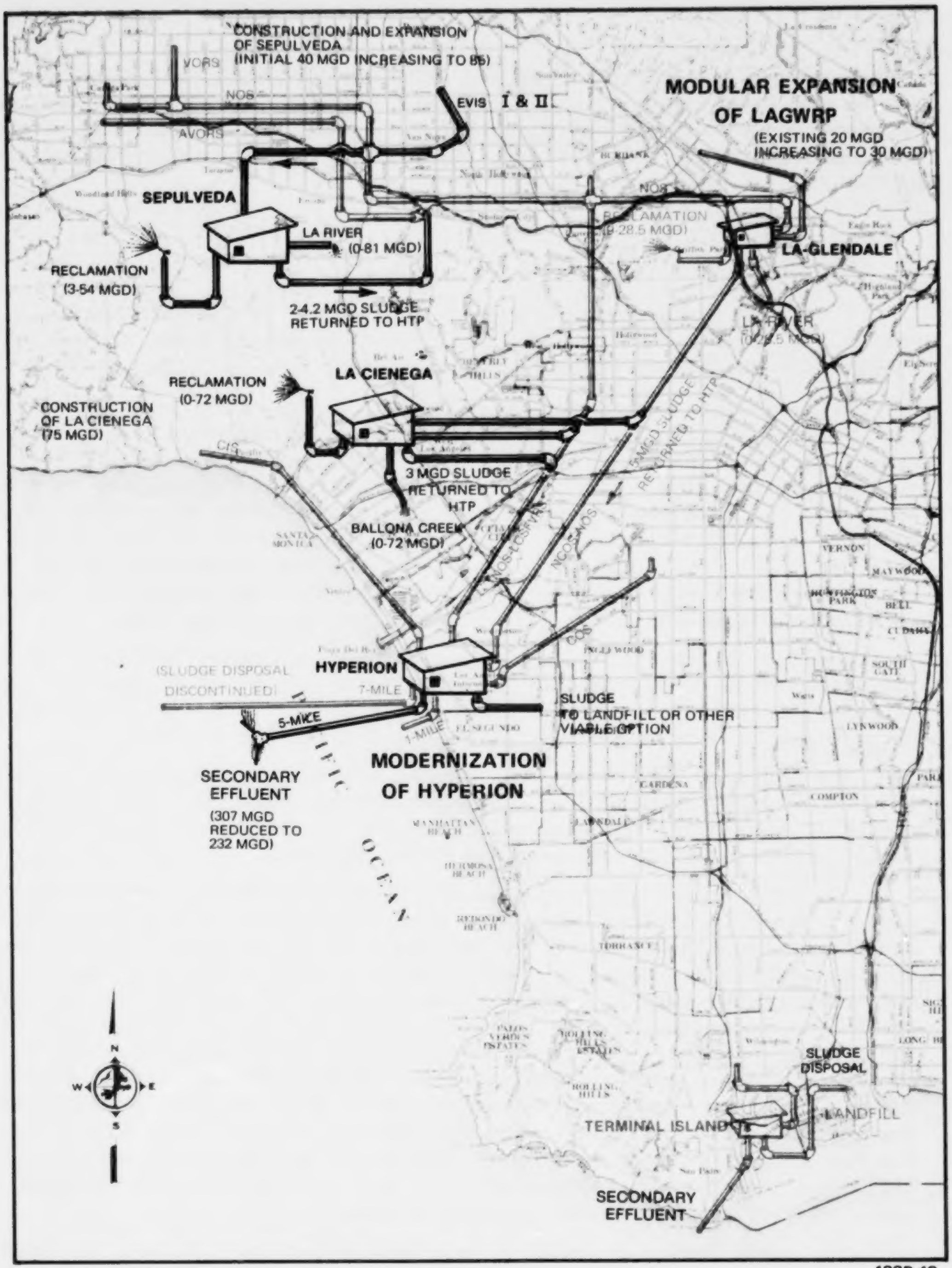
CONSTRUCTION AND EXPANSION
OF SEPULVEDA
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VORS
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MODULAR EXPANSION
OF LAGWRP
(EXISTING 20 MGD
INCREASING TO 30 MGD)
NOS
RECLAMATION
(0-28.5 MGD)
LA-GLENDALE
SEPULVEDA
LA RIVER
(0-81 MGD)
RECLAMATION
(3-54 MGD)
2-4.2 MGD SLUDGE
RETURNED TO HTP
LA RIVER
(0-28.5 MGD)
LA CIENEGA
RECLAMATION
(0-72 MGD)
CONSTRUCTION
OF LA CIENEGA
(75 MGD)
CIS
5 MGD SLUDGE
RETURNED TO HTP
3 MGD SLUDGE
RETURNED TO
HTP
BALLONA CREEK
(0-72 MGD)
NOS-LCSFVR
NCOS-NOS
COS
HYPERION
(SLUDGE DISPOSAL
DISCONTINUED)
7-MILE
5-MILE
1-MILE
SLUDGE
TO LANDFILL OR OTHER
VIABLE OPTION
MODERNIZATION
OF HYPERION
SECONDARY
EFFLUENT
(307 MGD
REDUCED TO
232 MGD)
PACIFIC
OCEAN
SANTA MONICA
INGLEWOOD
VERNON
MAYWOOD
HUNTINGTON PARK
BELL
CUDAHY
SOUTH GATE
LYNWOOD
COMPTON
GARDENA
MANHATTAN BEACH
HERMOSA BEACH
REDONDO BEACH
TORRANCE
PALOS VERDES ESTATES
ROLLING HILLS ESTATES
ROLLING HILLS
N
W
E
S
SLUDGE
DISPOSAL
LANDFILL
TERMINAL ISLAND
SECONDARY
EFFLUENT

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*The City feels a change in Health Department regulations may allow groundwater recharge of Sepulveda effluent up to 45 mgd. It is felt, however, this is unlikely.

Figure GS-50. Major elements of alternative E2.

Table GS-17. Costs (1975 dollars in millions) and present worths for alternatives receiving final consideration.

	A1 NO PROJECT	HYPERION/ SEPULVEDA B4C	HYPERION C3	RECLAMATION E2
Total Construction Cost	$ 122	$ 277	$ 347	$ 343
Total Operational Cost	235	453	403	511
Total Project Cost	357	730	750	854
Construction Present Worth	$ 97	$ 201	$ 274	$ 242
Operational Present Worth	105	190	169	208
Total Present Worth	202	391	443	450

Note: These are the costs presented in the preliminary drafts of the Facilities Plan. They are expected to change after the Draft Facilities Plan is published (simultaneous with the EIS) and undergoes review by concerned agencies.

quantities of reclaimed water with alternatives B4C and E2. In the reclamation analysis, alternative B4C is augmented to result in a production of reclaimed water equal to that provided by alternative E2. Table GS-18 presents cost comparisons between alternative E2 and augmented alternative B4C. Results of the study presented in Appendix F to the Facilities Plan indicate that implementation of augmented alternative B4C would result in increased requirements for dollars, energy, land and revenue support as compared to the same level of water reclamation under alternative E2. When the total costs of providing full secondary treatment and reclamation are considered, augmented alternative B4C would be somewhat less expensive than E2 as shown in Table GS-18.

Table GS-18. Cost analysis of HTP and LCWRP sewage treatment plus water reclamation.

IDENTIFICATION OF SYSTEM	SYSTEM CAPITAL AND O&M COSTS, 1975 DOLLARS IN MILLIONS	
	ALTERNATIVE E2	ALTERNATIVE B4
Sewage Treatment for Ocean Disposal		
Hyperion TP (1980)	\$449 (307 mgd)[2]	\$468 (307 mgd)
La Cienega WRP (1985)	\$111 (75 mgd)	
Water Reclamation[1]		
System Alternative No. 1	\$206	\$221
System Alternative No. 2	276	301
System Alternative No. 3	245	271
System Alternative No. 4	315	351
System Alternative No. 5	269	326
System Alternative No. 6	339	402
Total—Range based on Water System Alternative	\$766-\$899	\$689-\$870

[1] SYSTEM ALTERNATIVE DESCRIPTION

	System Alternatives and Level of Use (mgd)					
	1	2	3	4	5	6
Standard Oil Refinery	8	8	8	8	8	8
SW Los Angeles Industries	30	30	52	52	52	52
West Coast Basin Barrier		35		35		35
Vernon Industries					20	20
Total Use	38	73	60	95	80	115

[2] Constructed with pure oxygen secondary system for 307 mgd with flexibility for conversion to 232 mgd with fine-bubble secondary system.

E. summary of primary impacts

GS-127

E. SUMMARY OF PRIMARY IMPACTS

1. IMPACTS ON PHYSICAL ELEMENTS OF THE ENVIRONMENT

a. Soils and Topography. All alternatives include construction at the HTP site. Considerable grading and removal of soil (mainly sand) from the HTP site will be required. Phase I construction will be included in all alternatives and will require removal of 210,000 cubic yards of material for construction of the new primary tanks. Phase II and III construction apply to alternatives other than A1 and would require removal of up to 1,300,000 cubic yards of material. The extensive earth moving operations could lead to problems of erosion and fugitive dust both at the HTP site and at the soil disposal location. Soil could also blow from trucks in transit. Soil disturbance at sites other than Hyperion would be small. Alternative A1 would have significantly less impact on soils than any other alternative. E2 would have the greatest impact, B4C next, and the impacts of C3 and CX would be somewhat less. There are no expected operational phase impacts of any alternative on soils except for landfill impacts which are being addressed in a separate study.

b. Hydrology and Water Quality. The only significant project impacts on hydrology will be potential discharges to the Los Angeles River. Impacts to water quality will result both during construction at HTP and during operation of all facilities.

(1) CONSTRUCTION PHASE. The quality of effluent discharged to the ocean will be reduced during the construction phases of modernizing HTP under the No Project Alternative (to be mostly completed by 1978) and converting HTP to full secondary treatment in the other alternatives (to be completed about July 1981) (CLA, 1976). For modernization, 8 of the 12 existing primary tanks will be out of service while they are renovated, and new tanks will be built. Probably only one or two tanks will be out of service at any given time. Secondary treatment will remain during this project so that the effluent quality will be altered very little from that at present. The removal of the existing 100-150 mgd of secondary treatment facilities for replacement with 200 mgd of pure oxygen secondary facilities will have an adverse impact on the marine environment during the 3-year construction period with no secondary treatment.

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Installation of the eductor pump system, however, will necessitate discharging all effluent from the 1-mile outfall for a period of approximately 2 to 3 weeks. The effluent, which will be chlorinated at this time, is expected to introduce chloramines and other chloro-derivatives into the marine ecosystem along with the other wastewater constituents such as viruses and bacteria. The short duration of this discharge will preclude any lasting effects on the near-shore water quality of Santa Monica Bay.

The proposed Facilities Plan alternatives for upgrading HTP to full secondary treatment involve a temporary degradation of effluent quality that will result from reduced treatment capabilities, including shutdown of primary tanks and the termination of secondary treatment. Storm flows may also lower the effluent quality when the secondary treatment system is out of service. Table GS-19 shows the changes in effluent quality expected during the 3 to 4 years of construction. Constituents such as phenols, nitrite nitrogen, manganese, and arsenic will remain unchanged while nitrate nitrogen will be decreased. Concentrations of the other constituents will be increased from 8 to 100 percent, and the concentration of total coliform bacteria and viruses discharged in primary effluent alone will exceed those discharged at present. The effects on the physical and chemical ocean environment will result not only from increased concentrations of most constituents, but also from increased sedimentation resulting from the higher settleable solids load. With the exception of total coliform bacteria, turbidity, and possibly oil and grease on the surface, the concentration of wastewater constituents (after initial dilution) is not expected to measurably increase in the water column near the outfall. The environmental load of these constituents, however, will increase as a result of the higher mass emissions rates.

During dewatering of the secondary tanks, mixed liquor (activated sludge plus wastewater in the activated sludge treatment process) will be discharged from the 5-mile outfall along with primary effluent for a period of two to three weeks (DPW, 1976). The mixed liquor may be discharged out of the 7-mile outfall, although this would require a longer dewatering period because of the smaller capacity of the 7-mile pipe.

The pump plant and 5-mile outfall will be out of service during construction of the effluent eductor main chamber (estimated 72 hours) and the primary effluent bypass (estimated 24 hours). These are scheduled after full secondary treatment is operational so that only chlorinated secondary effluent will be discharged from the 1-mile outfall for approximately 2 to 3 weeks during construction (DPW, 1976).

In summary, the potential impacts to the ocean environment during the construction phase for alternatives B4C, CX, C3 and E2 will result from:

- Loss of secondary treatment for 3 years and consequent increase in release of nutrients and toxicants.
- Release of the activated sludge presently in the system through either the 7-mile or the 5-mile outfall, requiring less than 1 month.

Table GS-19. Predicted impact of temporary termination of secondary treatment. Effluent characteristics for the present HTP 5-mile wastewater discharge and primary effluent based on 1974 data. The percent increase in constituent concentrations if only primary effluent is discharged is also shown (data from DPW, 1975a).

PARAMETER	CONCENTRATION (mg/l)		PERCENT INCREASE IN PRIMARY
	5-MILE EFFLUENT	PRIMARY EFFLUENT	
COD	250	318	27
BOD	121	171	41
TSS	83	103	24
TDS	870[2]	940	8
TS	953[2]	1,043	9
pH[1]	7.3	7.2	-
Oil and Grease	18	29	61
Phenol	0.06	0.06	0
Detergent (MBAs)	5.1	7.7	51
Organic N	6.3	7.9	25
NO_2-N	0.0	0.0	0
NO_3-N	0.3	0.2	– 33[4]
NH_4-N	13.8	15.8	15
SiO_2	19.1[2]	20.0	5
PO_4	24.4	31.7	30
Cyanide	0.20	0.28	40
Aluminum	0.55[2]	0.68	24
Copper	0.19	0.22	16
Zinc	0.24	0.34	42
Iron	0.64	0.69	8
Nickel	0.18	0.20	11
Lead	0.04	0.05	25
Arsenic	0.01	0.01	0
Cadmium	0.02	0.03	50
Hexavalent Chromium	0.00	0.00	0
Trivalent Chromium	0.21	0.27	29
Manganese	0.02	0.02	0
Selenium	0.02	0.04	100
Mercury	0.0032	0.0041	28
Silver	0.02	0.03	50
Total Identifiable Chlorinated Hydrocarbons	0.0014	0.0017	21

[1] pH has no units.

[2] Calculated value.

[3] Undefined increase.

[4] Negative number indicates a decrease .

- Potential degradation of the primary effluent quality through the 5-mile outfall during storm flows because of the reduced HTP capacity.
- Discharge of all secondary chlorinated effluent through the 1-mile outfall for approximately 2 to 3 weeks during construction of effluent eductor.
- Decreased quality of primary effluent during renovation of the primary tanks.

Section 2 summarizes impacts to biological elements of the marine environment.

(2) OPERATION PHASE. The expected quality of effluents from HTP for each alternative are shown in Table GS-20. Effluent quality expected from reclamation plants included in alternatives B4C, CX, and E2 are shown in Table GS-21. With the No Project alternative (Al), the City of Los Angeles' share of treated plant effluent (9mgd) from LA-Glendale would be discharged to the Los Angeles River. Quantities percolating into the groundwater would become available for use indirectly along with other groundwater resources.

Since the Los Angeles River below the plant is unlined for 8 km (5 miles), there will be some percolation of tertiary effluent into the groundwater. The potential impacts to groundwater quality from this input of tertiary effluent are generally unknown. The constituents of concern are nitrates, viruses, synthetic organic compounds, and TDS. Concentrations of nitrate and TDS are lower in the effluent than in the river. Potential hazards of viruses are currently being evaluated and will be discussed in more detail in a supplement to this report.

Treated effluent not percolating into the groundwater will continue to flow down the Los Angeles River and be discharged into Los Angeles Harbor. Increasing the volume of water in the Los Angeles River is not expected to alter the natural flows substantially, particularly during wet weather when flows are normally quite variable.

The effects of increasing the discharge of the Los Angeles River on the size of the tidal prism are difficult to predict. During wet weather, the effects are probably indistinguishable from those caused by the variations in natural flows, but during dry weather, the size of the estuarine zone would be augmented by LA-Glendale discharges. Addition of tertiary effluent from LA-Glendale to the Los Angeles River should generally improve the quality of the river water.

For alternatives B4C and E2 flow in the Los Angeles River will be augmented as a result of effluent discharges from Sepulveda and LA-Glendale. However, none of the discharges to the river from Sepulveda are expected to cause the total flow to exceed the capacity of the low-flow section of the unlined channel.

Table GS-20. Characteristics of the HTP 5- and 7-mile effluents in 1975 along with the predicted 5-mile effluent for No Project (A1) and full secondary treatment (B4C, C3, CX, E2) (HTP, 1976; CLA, 1976; Hoeptner, December 23, 1976).

CONSTITUENT	CONCENTRATION (mg/l)				
	5-MILE		7-MILE	5-MILE	OCEAN PLAN STANDARDS TO BE EXCEEDED < 50% OF THE TIME[4]
	1975[1]	PREDICTED[2] NO PROJECT	1975[1]	PREDICTED FULL SECONDARY[3]	
COD	250[5]	198	7,700[5]	70	
BOD	125	96	1,900[5]	15	
TSS	85	65	7,300[5]	25	50
TDS	870[5]	923	954[5]	904	
pH (no units)	7.3	7.1	7.3	6.9	6 to 9
Oil and Grease	20	15.3	970	0.7	10
Phenols	0.04	0.04	0.05	0.02	0.5
Detergents (MBAS)	3.9	4.6	ND	1.27	
Organic Nitrogen	8.5	6.9	344	5.76	
Nitrite Nitrogen	0.07	0.02	ND	0.03	
Nitrate Nitrogen	0.16	0.17	ND	0.14	
Ammonia Nitrogen	13.9	16.4	300[5]	17	40
Silicate	19.1[5]	20	ND	21	
Phosphate Phosphorus	9	18	80	3.39	
Cyanide	0.14	0.2	0.67	0.11	0.1
Aluminum	0.55	0.57	ND	0.46	
Copper	0.19	0.17	16.8	0.11	0.2
Zinc	0.23	0.29	23.1	0.23	0.3
Iron	0.64[5]	0.61	78.7[5]	0.53	
Nickel	0.15	0.17	3.1	0.14	0.1
Lead	0.13	0.04	2.05	0.03	0.1
Arsenic	0.01	0.01	0.29	0.01	0.01
Cadmium	0.02	0.03	1.17	0.02	0.02
Chromium (+6)	0.00[5]	0.00	ND	0.00	0.005[6]
Chromium (+3)	0.13	0.21	11.7	0.14	
Manganese	0.02[5]	0.03	0.19[5]	0.03	
Selenium	0.02	0.03	0.27	0.019	
Mercury	0.002	0.003	0.108	0.02	0.001
Silver	0.02	0.03	0.80	0.019	0.02
Total Identifiable Chlorinated Hydrocarbons	0.00614	0.0018	0.02747	0.002	0.002

[1] Data from HTP (1976) and CLA (1976).

[2] Predicted assuming primary treatment of 214 mgd of 1974 quality + secondary treatment of 200 mgd with quality of last column.

[3] Prediction for UNOX.

[4] These are median values where the outfall concentrations are means. If the outfall values form a normal distribution about the mean, the mean is the same as the median.

[5] 1974 effluent quality.

[6] Total chromium.

Table GS-21. Predicted effluent characteristics for LA-Glendale, Sepulveda and La Cienega (DPW, 1976; CLA, 1977).

CONSTITUENT	CONCENTRATION (mg/l)[1]	
	LAGWRP & SWRP	LCWRP
BOD_5	5[3]	5[3]
COD	25[3]	25[3]
Oil and Grease	< 10	
Settleable Solids	< 0.1[2]	
Suspended Solids	< 5[3]	5[3]
TDS	500[3]	650[3]
Total Hardness ($CaCO_3$)	95[3]	130[3]
Alkalinity ($CaCO_3$)	120[3]	165[3]
Turbidity (TU)	7[2]	
Color (Color Units)	35[2]	
Threshold Odor No.	0[2]	
pH (no units)	7.7, 7.4[3]	7.4[3]
Phenols	0.01	
Detergents - MBAS	< 0.5	
Phosphate (ortho)	10[3]	10[3]
Ammonia Nitrogen	10[3]	10[3]
Nitrate Nitrogen	5[2]	
Nitrate-Nitrite Nitrogen	0[3]	0[3]
Total Nitrogen	6.7	
Total Kgeldahl Nitrogen	10[3]	10[3]
Cyanide	< 0.02	
Arsenic	0.04[2]	
Boron	< 1	
Fluoride	0.8[2]	
Chloride	48	
Chloride + Sulfate	151[2]	
Sulfate	59	
Barium	0.00[2]	
Cadmium	0.01	
Copper	0.04	
Chromium, total	0.01	
Chromium, hexavalent	0.03[2]	
Nickel	< 0.09	
Mercury	< 0.001	
Lead	< 0.05	
Selenium	0.05	
Silver	0.05	
Zinc	0.08	
Radium-226 (pCi/l)	0.24[2]	
Strontium-90 (pCi/l)	1.1[2]	
Total β-activity (pCi/l)	22.1[2]	
Total α-activity (pCi/l)	1.06[2]	
Fecal Coliform Bacteria (MPN/100 ml)	2.2[2]	
Sodium Absorption Ratio	4.5[2]	

NOTE: Discrepancies such as those for chromium and chloride + sulfate are a result of analyses in different years.

[1] Unless otherwise noted; values based on June 1976 analysis.

[2] Based on 1968 analysis.

[3] From CLA (1977).

The quality of effluents from Sepulveda, LA-Glendale, and La Cienega are predicted to be the same, and the quality is generally better than that in the river. Alternatives E2 and B4C include the construction of the Sepulveda Facility. To protect groundwater quality, the Health Department requires that if Sepulveda effluent is discharged to the Los Angeles River, then the river cannot be diverted to the Headworks Spreading Grounds for percolation. Therefore, implementation of either of these two alternatives will result in the cessation of the existing reclamation through groundwater recharge.

The maximum improvement of Hyperion facilities under the No Project alternative would result in the discharge of up to 200 mgd of secondary effluent mixed with approximately 200 mgd of primary effluent. This expected quality is shown in Table GS-20. The effluent currently does not meet the Ocean Plan 50 percent standards for 10 of 22 constituents and the 10 percent standards for 13 constituents. Assuming a normal distribution about the means in Table GS-20, the No Project effluent will continue to exceed the 50 percent standard for as many or more constituents than did the 1975 effluent.

The No Project alternative also presently assumes continuation of present sludge disposal to the ocean. The impacts of continuing this practice are predicted to be greater than those that have resulted from the present discharge because of the increased mass emissions and possibly increased concentrations. The past impacts have been discussed in Section C.

- The release of solids from the 7-mile outfall to Santa Monica Bay augments turbidity in the Bay. For toxicants, dilutions of the effluent ranging from roughly 200:1 to 70,000:1 would be required to bring concentrations to general ocean background levels. Most of the metals (> 90 percent) are associated with the particulates, and some mobilization may occur as the particulates mix with seawater, especially for nickel and cadmium.
- Benthic sediments have been substantially altered in an area approximately 2 km on a side and to a depth of over 30 cm. The percentage of the particulates released that remain in the vicinity of the outfall, however, are unknown. Numerous sludge constituents (BOD, COD, arsenic, cyanide, sulfides, volatile solids, heavy metals, and chlorinated hydrocarbons) have higher than background concentrations in the sediments near the 7-mile outfall. The ultimate fate of the discharged solids and their associated toxicants is also unknown, although currents may distribute them a considerable distance from the outfall.

Alternatives B4C, C3, and E2 all propose full secondary treatment at HTP. (See Table GS-20 for quality predictions.) The reductions in concentration (see Table VIII-14) and mass emissions (see Table VIII-18, alternate B4C) of most effluent constituents will significantly decrease deposition of sediments of wastewater origin near the 5-mile and 7-mile outfalls, and will curtail contribution of HTP effluent to degraded water quality in Santa Monica Bay. Although the only constituents of HTP effluent that have been monitored to show distribution of the HTP effluent plume are turbidity (a result of suspended solids) and coliform bacteria, it is assumed that all constituents are similarly distributed. It is anticipated that both areal distribution and concentration of suspended solids, coliform bacteria, and other wastewater constituents of HTP origin will be decreased. The cessation of the sludge discharge and the provision of full secondary treatment will greatly reduce the potential for bioaccumulation and biomagnification through the food web. Based upon the foregoing, it is anticipated that the improved effluent quality will significantly improve the water and sediment quality of Santa Monica Bay. Even with secondary treatment, the effluent probably will not meet the permit 50 percent standards for cyanide, chromium, mercury, and nickel (assuming normal distribution about the mean). New controls on the sources of mercury (mainly hospitals), cyanide, and nickel would be required to bring HTP discharges into compliance with Ocean Plan standards. The special problem of chromium is discussed in Chapter VI. Mass emissions for all alternatives are given in Table GS-22.

Cessation of sludge discharge as proposed for B4C, C3, CX, and E2 will immediately stop the accumulation of sludge-related organic and toxic substances in the sediments. It is not known whether the substances already in the sediments will ever be mobilized and dissolved in the water, but strong evidence against rapid mobilization is presented in Chapter III.

The impacts of terminating sludge discharge on the concentrations of dissolved toxic substances in the water column cannot be accurately predicted because neither the concentrations of these substances in the water column nor the amount released into the water column from sludge particulates is known. The expected reductions in mass emissions of terminating the sludge discharge range from approximately 1 percent for silicate to 98 percent for oil and grease. The emissions of heavy metals would be decreased 27 to 75 percent and chlorinated hydrocarbons by 71 percent. Total nitrogen would be decreased by more than 34 percent.

c. Air Resources. Air quality will be adversely affected during construction at the HTP site due to vehicle emissions, dust generation, and temporary releases of sewage odors. In addition to the dust generated during earth-moving, demolition is expected to cause increase in particulates. This impact is expected for all alternatives.

For alternative B4C and probably E2, over 80,000 truck trips would be required to remove 1,500,000 cubic yards of soil from the HTP site. This activity would probably have the greatest single direct adverse impact on air quality of any construction phase element, but the duration would be limited and possible mitigation measures could be implemented to reduce dust.

During operations for all alternatives, there would be minor adverse impacts on air resources due to additions to levels of vehicular emissions.

Table GS-22. Mass emission rates for constituents in the HTP 5-mile effluent in 1975 and those predicted for each of the alternatives.

CONSTITUENT VOLUME (MGD)	MASS EMISSION RATES (METRIC T/YR)				
	PRESENT 5-MILE	PRESENT 7-MILE	A2[1]	B4C	C3[3]
COD	117,816[4]	50,015[4]	113,400	29,699	38,309
BOD	59,599	12,341[4]	54,698	6,364	8,209
TSS	40,327	47,416[4]	37,361	10,607	13,682
TDS	409,998[4]	5,547[4]	527,865	383,544	494,734
TS	449,113[4]	41,209	565,243	394,151	508,416
Oil and Grease	9,536	5,764	8,754	270	383
Phenols	19	1.7	23	8.5	11.0
Detergents (MBAS)	1,860	ND	2,626	359	695
Organic Nitrogen	4,053	2,044	3,931	2,444	3,152
Nitrite Nitrogen	33	ND	8.6	12.7	16.4
Nitrate Nitrogen	76	ND	97	59	77
Ammonia Nitrogen	6,627	1,949[4]	9,383	7,213	9,304
Silicate	9,001[4]	ND	11,729	8,910	11,493
Phosphate phosphorus	4,291	475	10,298	1,438	1,855
Cyanide	67	4.0	114	47	60
Aluminum	259[4]	ND	326	195	252
Copper	91	99.8	97	47	60
Zinc	110	137	166	98	126
Iron	302[4]	511[4]	349	225	290
Nickel	72	18.1	97	59	77
Lead	14	12.2	23	12.7	16.4
Arsenic	4.8	1.7	5.7	4.2	5.5
Cadmium	9.5	7.0	14	8.5	11.0
Chromium (+6)	0.0[4]	ND	0.0	0.0	0.0
Chromium (+3)	62	69.5	120	59	77
Manganese	9.4[4]	1.2[4]	14	12.7	16.4
Selenium	9.5	1.6	17	8.1	10.4
Mercury	0.95	0.6	1.9	1.0	1.3
Silver	9.5	4.8	14	8.1	10.4
Total identifiable Chlorinated Hydrocarbons	2.9	0.16	1.03	0.9	1.1

[1] No Project based on maximum predicted effluent volume by SCAG for the year 2000 and 200 mgd secondary.

[2] E2 is the same as B4C except that in 1985, the volume would decline to 232 mgd thus reducing emissions by 24 percent.

[3] CX is 25 percent less with a volume of 386 mgd.

[4] Based on 1974 effluent quality.

At Hyperion, approximately 40 truck trips per day will be required to dispose of sewage sludge in landfills for alternatives B4C, C3, CX, and E2. Commuting of additional employees will also produce emissions. This impact will be greatest for alternative E2, somewhat less for B4C, CX, and C3, and least for A1.

d. Noise and Vibration. Construction traffic and demolition will be the major sources of noise and vibration during construction phases. Impacts will be greatest at the La Cienega site (E2) and at Hyperion (all alternatives).

During operations, minor noise impacts will result from placing treatment plant where none presently exist (Sepulveda site), from expansion (Hyperion and LA-Glendale), and from replacing an existing use with a treatment facility (La Cienega). In the case of the latter, noise levels during operation will probably be reduced from existing conditions.

2. IMPACTS ON BIOLOGICAL ELEMENTS OF THE ENVIRONMENT

a. Terrestrial Resources. Construction activities will disturb existing terrestrial habitats. Because of the greater number of construction sites necessary for implementing alternatives B4C and E2, these projects will have the greatest impacts. A1 would disturb only the HTP site.

No significant biological resources were identified on any of the proposed sites and no such resources would be disturbed during construction. The endangered El Segundo blue butterfly (*Shijimiaeodes battoides allyni)* utilizes *Eriogonum parvifolium* as a food plant. Both the butterfly and the shrub are found near, but not on the HTP site during a one-day search. The coastal strand habitat on airport property adjacent to HTP is considered by the county to be an ecologically significant area. It is also the largest remaining area of habitat for the El Segundo blue. This site would not be seriously disrupted during HTP construction, but background noise levels and air pollutants would increase, especially during daylight hours. Peak noise levels would still be due to aircraft rather than construction. Air pollutants and noise due to construction are not expected to have any noticeable effects on biological resources of the airport dunes.

Primary impacts of the project on terrestrial ecosystems would result from the need for landfill space for disposal of sludge and from the availability of reclaimed water for irrigation purposes. The impacts of landfill requirements are treated in a separate report describing the environmental effects of the Interim Sludge Disposal Program.

Reclaimed water will be used for irrigation of golf courses and parks. If reclaimed water were not available, the same facilities might be maintained by using water from other sources— probably at greater expense.

Watered areas will be primarily for human use through culture of lawns and ornamental plantings. However, these habitats will be used by some species of birds, small mammals, reptiles, and amphibians. No significant biological resources will be supported or otherwise affected by the use of reclaimed water for irrigation. Alternative E2 has the greatest potential for producing reclaimed water and B4C would be next. Alternatives A1, C3, and CX would produce little or no more than the 18.5 mgd from LA-Glendale that is part of the existing system.

b. Aquatic Resources. The impacts on water quality discussed above will be reflect in associated biota.

(1) CONSTRUCTION PHASE. For alternatives B4C, C3, and E2, there are two major types of biological effects that occur as a result of increased concentration and mass emissions of toxic substances in the 5-mile effluent during construction at HTP. One is the possibility of direct toxic effects to organisms exposed to the undiluted effluent, and the second is the potential for increased bioaccumulation in organisms and biomagnification through the food web of these substances.

The effluent dilutes rapidly as it leaves the discharge ports of the 5-mile outfall diffuser arms. But, because organisms live in the immediate vicinity of and on the diffuser arms, some are undoubtedly exposed to the undiluted effluent. Reversion to primary treatment will result in increased concentrations of toxicants so that the direct toxic effects that now occur would be expected to occur over a wider area as the effluent is diluted, and in the immediate vicinity of the outfall, direct toxicity may occur to organisms whose toxicity threshold had not been exceeded previously. Whether or not direct toxic effects presently occur, however, is not known. The increased mass emissions would increase the potential for bioaccumulation in marine organisms.

The discharge of nutrients from HTP will increase during construction, and could enter the food chain and cause beneficial impacts on the fishery. The temporary reversion to full primary treatment could potentially result in the fish production attributable to HTP being increased by a maximum of 22 percent over 1974 levels. This is discussed in Chapter III and many factors probably would limit the extent to which benefits would occur.

(2) OPERATIONAL PHASE. The No Project alternative will result in discharges from LA-Glendale to the Los Angeles River. Impacts on river biota resulting from increases in river flow will be the most important in the summer dry months. The biological importance of occasional overflows from the low flow channel will be to increase the exposed wetted channel surface area, thus creating more aquatic habitat in which odor causing algae and obnoxious insects may proliferate using the nutrient-rich water. The increased flow into the tidal prism will greatly increase

and stabilize the fresh to salt water gradient downstream from Willow Street. Increase in size and stability of the estuarine zone of the Los Angeles River could benefit the establishment of a limited community of brackish water organisms, subject, however, to periodic purging by wet weather high flows.

The effects of the No Project alternative upon the biota in Santa Monica Bay and the Southern California Bight will involve little change from the present impacts, although volume and quality of effluent and sludge will change slightly by the year 2000. The increased mass emissions from both outfalls will increase the potential for bioaccumulation in organisms. No project impacts would be essentially a continuation of the existing impacts summarized in Section C3. Of major concern is the possibility that the constituents being released from the HTP outfalls may cause gradual sublethal effects throughout the food web and result in an altered species composition. Toxicants may be bioaccumulated in individual organisms, be concentrated through the food web, and ultimately end up interfering with reproductive success of marine birds and mammals or end up in human food supplies. As detailed in this report, chlorinated hydrocarbons and heavy metals of the type released from HTP (but not necessarily in the same chemical form) do appear in the tissues of sport and commercial fish as well as in marine mammals and birds, where they are known to have deleterious effects. It has not been possible to trace any such contamination directly to HTP effluent, but since organisms in the Bight do concentrate these substances and since HTP does release them, it can be inferred that some percentage of the uptake is attributable to HTP.

Alternative B4C and E2 could result in discharges of water to the Los Angeles River that would provide permanent flow which could augment the available aquatic habitat, particularly along the unlined portions of the river. Discharges of reclaimed water to the Los Angeles River from Sepulveda and LA-Glendale will increase the flow in a portion of the river that is not completely concrete lined and, thus, would create a fairly "natural" riverine aquatic habitat that could potentially support a variety of organisms. The species inhabiting the river above the Los Angeles Narrows after Sepulveda and LA-Glendale begin discharging will be those that are tolerant of variable flows or those than can recolonize rapidly. Below the Los Angeles Narrows, the river is concrete lined and the increased flows would have a minimal effect until the volume exceeds the capacity of the low-flow section. When this occurs in the lower stretches of the river, the additional wetted surfaces could support algae and aquatic insects. Production of these organisms at nuisance levels would not be expected except if pooling and stagnation occurred as water levels fluctuated.

The increased influx of freshwater into the tidal prism would enlarge the estuarine zone in proportion to the input, and the potential impacts on the biota are expected to be similar to those discussed for the No Project alternative, but over a larger area.

Impacts that will occur as a result of conversion to full secondary treatment at HTP (B4C, C3, CX, and E2) can be attributable to three categories of changes. First, there will be decreases in the amounts and concentrations of toxic compounds released, almost certain to be viewed as a beneficial change. Second, there will be decreases in the amounts of total suspended and dissolved solids released, which will probably alter the turbidity and light penetration near the outfall, as well as concentrations of toxic substances associated with the particles, a beneficial change. And third, there will be a substantial (67 percent) decrease in the phosphate additions as well as a small (10 percent) decrease in the total nitrogen additions. The decrease in release of these nutrients is of little concern because the long-term releases of them from HTP probably have no significant role in supporting the existing fishery in Santa Monica Bay.

(a) General Impacts of Nutrient Alterations. The overall levels of nutrients will be decreased as a result of conversion to full secondary treatment with a 10 percent decrease in total nitrogen releases. The concentration and mass emissions of nitrite and nitrate nitrogen as well as organic nitrogen will be decreased, while ammonia nitrogen increases. The various forms of nitrogen are utilized by different species of organisms as discussed in Chapter III, so that a change in the form of nitrogen released may alter the species composition of organisms now utilizing nitrogen from HTP in Santa Monica Bay. Phytoplankton generally utilize nitrate nitrogen most efficiently, and a decrease in the nitrogen immediately available to phytoplankton may decrease their productivity in the food web, but it is very unlikely that decreases to the fishery would be great, if at all.

(b) Impacts of Toxicant Reductions. It is not possible to predict whether an improvement in the quality of the wastewater discharged into Santa Monica Bay would allow kelp to reestablish in areas where it formerly existed because of the complex interaction of variables that influence kelp growth (temperature, turbidity, sedimentation, grazers, etc.). Reductions in toxicant concentrations brought about by full secondary treatment may eliminate some of the impacts of copper and silver that may presently exist. It will also decrease the potential impacts of silver on fish. The other toxicants are currently below the levels for which direct toxicity has been demonstrated.

The direct toxic effects, however, are not the most important effects of the release of heavy metals and other toxicants in wastewater. As detailed in Chapter III, many marine organisms are capable of concentrating (bioaccumulation) metals and chlorinated hydrocarbons in their tissue from relatively low concentrations in the sea water and in their food. The accumulation of toxic substances in fish tissues, particularly of mercury, lead, and chlorinated hydrocarbons, is of prime interest for public health reasons. Two commercially important species, swordfish and tuna, presently have high mercury levels in their tissues, in some cases exceeding public health standards. In the absence of any clear evidence about bioaccumulation of toxicants directly traceable to the existing outfall, the only conclusions that can be reached about the impacts of conversion to full secondary treatment are that the reduced toxicant concentration and mass emissions can only result in a less negative impact than currently exists.

Following cessation of sludge discharge there probably will be a shift in the species composition of the benthic infauna near the 7-mile outfall over time to a new equilibrium, presumably similar to the pre-discharge condition. Extrapolation from nearby areas suggests that this will be an *Amphiodia*-dominated community.

The cessation of sludge discharge is expected to have very little effect on nektonic invertebrates. Termination of discharge should result in a reduction in the occurrence of fin erosion disease in fish, and the distribution of some species may be altered since some species appear to be attracted to the outfall while others avoid it. Termination of sludge discharge would not be expected to decrease the commercial fishery and it probably will not produce any measurable change in the catch.

Termination of sludge discharge will decrease the mass emissions of toxicants into Santa Monica Bay. As a consequence, the direct effects of this discharge on organisms in the Bay (e.g., lethal and sublethal toxic effects) will cease. Indirect effects, such as bioaccumulation and biomagnification through the food web, that have resulted from the constituents in this discharge will also desist.

3. IMPACTS ON SOCIOECONOMIC ELEMENTS OF THE ENVIRONMENT.

a. Land Use and Aesthetics. Primary project impacts on land use for alternatives A1, C3, and CX will be limited to continuing use of treatment facility sites for sewage treatment purposes, and for B4C and E2 some sites will be converted from existing uses to treatment facilities. At Sepulveda about 88 acres of agricultural land would be used, and at La Cienega (E2 only) 25 acres of an existing commercial use would be displaced, and a change in zoning from M-2 to M-3 would be required.

Adverse construction phase aesthetic impacts would result from noise, dust, and other inconveniences which are expected to be of minor significance. (At the La Cienega site, demolition impacts should be investigated.)

No adverse aesthetic impacts are expected from operation of facilities. Odor problems present at HTP will be much improved as a result of all alternatives.

b. Employment. Table GS-23 presents the costs and labor requirements for constructing project elements of each alternative. The wastewater facility construction workers— those associated with the earlier heavy projects— could amount to between 11 and 20 percent of the construction labor unemployed in Los Angeles County (for alternatives B4C, C3, CX, and E2). In these terms, then, the employment generated by wastewater facility construction needs would be a potentially large source of alleviation of the chronically large unemployment in the construction sector.

Table GS-24 shows labor requirements for the operational phases of alternatives. Because of the greater number of facilities to operate, alternative E2 would provide the greatest number of new job opportunities (almost 250); B4C would provide about 200; and other alternatives, less than 100.

Construction and operation of the La Cienega facility would terminate employment for workers at the existing FedCo store. Since FedCo would be expected to open a new store, no major net change in employment opportunities would result from the closure although individuals might not be able to continue their employment in a new location.

c. Economy. Tables GS-23 and GS-24 present direct project costs up to 850 million dollars (E2), most of which would be spent in the area over the 25-year project life. Since much of the money would come from state and federal funds and would be spent locally, there would be a distinct beneficial impact on the local economy. Construction phase impacts would be most beneficial because of spending over a short period of time with construction grant funds amounting to 87.5 percent of the costs. During the operational phase, costs would be paid by users, and households would pay service fees amounting to roughly a $2.65 per month by 1982.

d. Community Services and Utilities. No significant primary project impacts are expected to result from alternatives B4C, C3 or E2 except for the reduced level of treatment at HTP during the construction phase. If the No Project alternative were selected, there would result the necessity of placing constraints on the volumes of waste entering the sewage system in the San Fernando Valley where hydraulic problems are expected soon. Constraints could take several forms. First, water rationing could be used to reduce the volume of sewage entering the system. Second, industrial and commercial facilities could be required to provide their own treatment and recycle water, thereby significantly reducing their contribution of waste volume to the sewer system. Third, bans could be placed on new sewer hookups. Alternative CX would result in similar but less severe restrictions.

Table GS-23. Summary of some primary economic impacts of construction of wastewater facilities.

ALTERNATIVE	ELEMENT	COST[1]	PRESENT WORTH[2]	CONSTRUCTION LABOR (MANYEARS)	CONSTRUCTION WAGES	CONSTRUCTION[3] JOBS
A1	HTP 200 mgd Secondary + Modern	$121,959,000	$ 96,713,000	2,132	$ 60,980,000	4,000
B4C, E2	HTP 307 mgd Secondary + Modern	171,282,000	139,708,000	2,994	85,641,000	5,000
E2	HTP Conversion Flexibility	10,400,000	9,079,000	182	5,200,000	300
CX	HTP 387 mgd Secondary + Modern	272,500,000	216,896,000	4,764	136,250,000	8,000
C3	HTP 397 mgd Secondary + Modern	287,182,000	228,583,000	5,021	143,591,000	9,000
B4C, C3, CS, E2	HTP Sludge Processing and Disposal	14,007,000	8,045,000	245	7,004,000	400
B4C, E2	Sepulveda Facility 40 mgd	38,356,000	21,759,000	671	19,178,000	1,000
B4C, E2	Sepulveda Facility 30 mgd Addition	21,503,000	15,331,000	376	10,752,000	600
B4C, E2	Sepulveda Facility 15 mgd Addition	11,569,000	3,423,000	202	5,785,000	300
E2	La Cienega WRP 75 mgd	56,189,000	32,338,000	982	28,095,000	2,000
B4C, E2	EVIS I	7,731,000	6,144,000	135	3,866,000	200
B4C, E2	EVIS II	4,604,000	2,793,000	80	2,302,000	100
B4C, CX, E2	L.A.-Glendale WRP 10 mgd Addition	5,937,000	2,432,000	104	2,969,000	200
C3	AVORS (85 cfs)	42,377,000	35,096,000	741	21,189,000	1,000
B4C, C3, CX, E2	Griffith Park Recl. Water Delivery System	819,000	706,000	14	410,000	20
B4C, E2	Sepulveda Recreation Area Recl. Water System	758,000	540,000	13	379,000	20
C3	Woodman Avenue Relief Sewer	2,672,000	1,621,000	47	1,336,000	80

[1] 1975 estimated dollar cost.

[2] Future (1975 level) costs discounted using 7 percent present worth rate.

[3] Differs from manyears of employment to account for less than full-time employment per individual on job:
Full-time = 2,112 manhours per year

Table GS-24. Summary of primary economic impacts of operation of elements of wastewater systems.

ALTERNATIVE	ELEMENT	YEARS COVERED BY O&M	TOTAL O&M COST (1975 $)	O&M PRESENT WORTH	O&M TOTAL DIRECT MY LABOR	TOTAL O&M PAYROLL
A1	HTP Secondary & Modern 200	1976-2000	235,390,000	104,934,000	6434	896,510,000
B4C*	HTP " " 307	1976-2000	371,582,000	158,604,000	7767	116,505,000
E2*	HTP " "w/Flex. 307	1976-2000	371,582,000	158,604,000	7767	116,505,000
CX*	HTP " " 387	1976-2000	394,000,000	165,794,000	7767	116,505,000
C3*	HTP " " 397	1976-2000	397,154,000	166,447,000	7767	116,505,000
B4C, E2	Sepulveda 40 mgd	1979-2000	44,968,000	18,456,000	990	14,850,000
B4C, E2	Sepulveda 30 mgd added	1981-2000	22,580,000	8,528,000	320	4,800,000
B4C, E2	Sepulveda 15 mgd added	1994-2000	3,948,000	899,000	56	840,000
E2	La Cienega 75 mgd WRP	1986-2000	58,500,000	18,057,000	990	14,850,000
B4C, E2	EVIS I	1980-2000	588,000	231,000	12.5	188,000
B4C, E2	EVIS II	1984-2000	289,000	97,000	6.2	92,000
B4C, CX, E2	LAGWRP 10 mgd added	1989-2000	4,956,000	1,361,000	84	1,260,000
C3	AVORS (85 cfs)	1980-2000	3,192,000	1,256,000	68	1,021,000
B4C, C3, EX, E2	Griffith Recl. Water 9 mgd	1979-2000	2,218,000	910,000	47	710,000
B4C, E2	Sepulveda Dam Recl. Water 9 mgd	1981-2000	1,432,000	541,000	31	458,000
C3	Woodman Ave. Relief Sewer	1984-2000	170,000	57,000	4	54,000

* Includes sludge disposal.

For HTP Secondary & Modern elements 1976 through 1981 were costed at 7,565,000 per year per Facilities Plan studies information 1977 - 1981 was changed to 1977 - 1982 as construction period to O & M (new) 1982 - 2000.

Present Worths may differ from some in Facilities Plan since Facilities Plan at times ascribed discount rate to entire cost for multiyear project at the starting year only. .32 was labor cost factor and $15,000/yr average salary

e. Energy Use and Conservation. Advance wastewater treatment requires more energy than does secondary treatment. Alternatives providing treatment at the most sites and producing the most reclaimed water (E2, then B4C) will use the most energy. This may be offset, however, by decreased needs for water importation, but calculations cannot be made until the exact source of water not imported is determined. For instance, if the water not imported would have come from high Sierra lakes and been used to generate electricity in hydroelectric plants while being transported to Los Angeles, there could be an additional adverse impact on energy supply. However, if the water not imported would have been pumped from deep wells, a net energy savings might be realized.

Land disposal of sludge will require about 30 times the energy presently expended for ocean disposal. This applies to all but the No Project alternative. Appendix VI-B discusses energy use of project alternatives in detail.

f. Traffic. Construction phase traffic impacts will be worst at the HTP site for all alternatives except A1. The capacity of Vista Del Mar would be exceeded during peak hours, but mitigation measures may be feasible. Construction of EVIS (B4C and E2) and of AVORS (C3) will also cause local traffic problems when lanes and cross-streets are blocked during sewer installation. Impacts on traffic during operations, probably will be unnoticeable.

g. Areas of Special Significance. No Project-related primary impacts are expected on known archaeological, historical, paleontological, or biological resources of special significance. Resources could be discovered during construction excavation, in which case this activity should cease until a proper evaluation by appropriate experts can be made.

F. summary of secondary impacts

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F. SUMMARY OF SECONDARY IMPACTS

1. INTRODUCTION

Major projects that increase the ability of an area to support a greater population may contribute to secondary effects in the form of changed patterns of social and economic activities and subsequent environmental impacts. These effects of the proposed project upon population and growth and the resulting effects upon the environment may be more substantial than the primary effects of the original action itself.

The EPA (Environmental Protection Agency, 1975) requires that secondary impacts be addressed in Environmental Impact Statements for Construction of facilities, to include:

"(i) induced changes in the pattern of land use, population density and related effects on air or water quality or other natural resources;"

"(ii) increased growth at a faster rate than planned for or above the total level planned by the existing community."

The issue with regard to secondary impacts is to determine what current constraints exist to growth, what projections there are for future growth, and what contribution the Facilities Plan Alternatives make to growth and concomitant secondary impacts. Mitigative measures can then be implemented to reduce the secondary impacts to an acceptable level so that environmental goals of water and air quality can be concurrently achieved.

Similarly, the State of California (State EIR Guidelines, 1977) requires description of "Changes induced in population distribution, population concentration, the human use of the land (including commercial and residential development) and other aspects of resource base such as water, scenic quality and public services" (Section 15143).

Typical impacts of growth include increases in automobile traffic with its associated air pollution, pressures upon existing utilities, highways, and public services (schools, hospitals, fire protection, etc.), and the loss of open space as undeveloped land is converted to urban expansion. The Hyperion System Service area is expected to grow by 194,000 people by 1990 and 310,000 by the year 2000.

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Because the Los Angeles area lies within a critical air basin that faces problems in attaining the goals of the Clean Air Act, substantial attention has been focused on the possibility that implementation of the Los Angeles Facilities Plan will lead to degraded air quality as a secondary impact of plan implementation. Also, there is concern that provision of additional sewage service in the San Fernando Valley will lead to an increase in population north of the mountains at the expense of the City area south of the mountains, producing increased vehicular traffic; and consequent decreased air quality in the north parts of the City. This analysis of secondary impacts has thus provided special emphasis on air quality factors as they may be related to implementation of plan alternatives.

2. FUTURE DEVELOPMENT PROSPECTS

Future development will create an unavoidable demand for public utilities, energy resources, and community services.

a. Utilities.

(1) ELECTRICAL POWER. Electrical energy for the service area is supplied by the City of Los Angeles Department of Water and Power (DWP). Increased urban development will create additional demands for electrical energy. The demand for electricity is expected to increase to 80 GWHPD (26.0 KWH PCD) by 1990 in L.A. City. It is not certain whether or not enough power can be obtained from new generating sources to meet the future demand; however, the development of nuclear power could provide the needed supply.

Table GS-25 presents the projections in demand for utilities within the four major subdivisions of the City of Los Angeles. These projections are based upon the SCAG-76 estimates of future population.

(2) NATURAL GAS. By the year 1990, the demand for natural gas within Southern California based on an extrapolation of currently available figures (ARB, 1975) is expected to be about 5,450 mmcf/d. Of this, about 2,250 mmcf/d would be gas demanded for electrical power generation. By 1990, the gas companies are projected to meet only half of the demand. However, limitations in the supply of natural gas are not expected to act as a constraint to population growth.

From Table GS-25 it is estimated that the San Fernando Valley will experience a growth of 35,000 single family homes (16% increase) and 76,000 multifamily homes (83 percent increase) over the period 1970 to 1990 (SCAG '76). Central City and West City, on the other hand, will undergo a growth oriented solely toward multifamily dwellings. The projected combined increase is 144,000 such units.

Table GS-25. Trend projections in demand indicator elements for the City of Los Angeles.

INDICATOR ELEMENT	AVERAGE USAGE THRESHD.	TOTAL CENTRAL	TOTAL VALLEY	TOTAL WEST	TOTAL HARBOR	TOTAL CITY
POPULATION 1970=		1,335,949	967,128	355,467	153,257	2,811,801
POPULATION 1990=		1,357,773	1,160,679	389,329	170,331	3,078,112
ELECTRICITY						
1970	(15.6 kwh/cap/day)	20.8 GWHPD	15.1	5.5	2.4	43.9
1990	(26.0 kwh/cap/day)	35.3 GWHPD	30.2	10.1	4.4	80
GAS						
1970	(164 CFPCD)	219 Mill. CFPD	159	58.3	25.1	461
1990	(170 CFPCD)	231 Mill. CFPD	197	66.2	29.0	523
WATER						
1970	(182 GPCD)	223 Mill. GD (167 GPCD)	198 (205)	67.9 (191)	23.3 (152)	512
1990	(170 GPCD)	220 Mill. GD (162 GPCD)	217 (187)	59.6 (153)	24.9 (146)	523
SEWAGE						
1970	(126 GPCD)	180 MGD (135 GPCD)	112 (116)	41.2 (116)	20.7 (135)	354
1990	(126 GPCD)	183 MGD (135 GPCD)	135 (116)	45.2 (116)	23.0 (135)	387
SOLID WASTE						
1970	(8.1 PPCD)	5,411 tons/day	3,917	1,440	621	11,388
1990	(10.2 PPCL)	6,925 tons/day	5,919	1,985	869	15,698

(3) WATER SUPPLY. One major reason behind the declining rate of water consumption is the trend toward multifamily housing. SCAG-76 projects an addition of 244,562 multifamily (54 percent increase) and a decrease of 28,066 single family units (5 percent decrease) in the City of Los Angeles by 1990. There is also a recognized need to conserve water resources in Los Angeles and this need will intensify over time as the population of Los Angeles, as well as other western water starved cities, increases. Most residential conservation practices are estimated to occur in the San Fernando Valley and western city areas where consumption rates are highest. These two areas are typified by relatively large landscaped yards. While the western city area has a low single family to multifamily unit ratio, single family homes in the area are commonly associated with some of the largest landscaped yards in the City. Table IX-2 indicates a 20 percent drop in consumption for the west city region, 9 percent for the San Fernando Valley, 3 percent for the central city region, and 4 percent for Harbor. In reality these decreases would be represented by a slight decrease in demand in the central part of the City with the largest increase in demand occurring in the San Fernando Valley.

The 20 percent drop calculated for the west region is probably too high as the loss in single family homes will occur around West Los Angeles, Century City, Palms and Mar Vista areas and not in the Santa Monica Hills where the greatest water usage rates occur. In fact, single family homes in the mountain portion of the west region are expected to increase in number. Therefore, the decrease in water consumption in 1990 in this region of the City may not be as great as projected.

(4) WASTEWATER. Additional growth in the City will increase demands for sewage disposal. Based on average rates of 116 gallons per capita day (GPCD) in the San Fernando Valley and West Los Angeles areas and 135 GPCD in the Central and Harbor areas an additional demand of 33 mgd is anticipated by 1990. Residential generation will remain at 85 GPCD. From Table GS-25 it can be seen that the largest increase in demand for a sewage disposal will occur in the San Fernando Valley.

(5) SOLID WASTE DISPOSAL. Solid waste disposal will increase with urban development creating a further demand for collection services, resource recovery facilities, and sanitary landfills. Additional growth could contribute as much as 4,310 tons per day of solid waste based upon a 8.1 pound per capita day average in 1975 and projected 10.2 per capita day average in 1990. From Table GS-25 it can be seen that again the largest increase in demand will occur in the San Fernando Valley (about 40 percent of the City total).

b. Land Use Plans. Future land use planning for the wastewater facilities planning area is presently in various stages of development. The Air Quality Maintenance Plan and the Areawide Wastewater Management Plan are in the beginning phases; the Coastal Plan has been completed; the Los Angeles County River Basin Plan has been approved by the Regional Water Quality Control Board and is near final adoption by the State Water Resources Control Board; the Concept Los Angeles and the Los Angeles Citywide Plan have been adopted, but the 35 community plans which establish actual land use policy for the City are in the various stages of preparation. The local planning process is dependent upon policy decisions generated typically by nonprofessional planners for each community planning area.

Table GS-26 presents a comparison of population capacity accommodated by existing zoning and General Plan as derived from preliminary and adopted Community Plans. Table GS-27 focuses upon the dwelling unit capacities of Community Planning areas in the San Fernando Valley. From Tables GS-26 and GS-27, it can easily be seen that Land Use Plans allow for an additional 110,025 dwelling units in the San Fernando Valley and zoning permits nearly twice that number.

Table GS-26. Comparison of population capacity accommodated by existing zoning and by the General Plan as derived from preliminary and adopted Community Plans (City of Los Angeles Planning Department 1976).

COMMUNITY OR DISTRICT STUDY AREA	EXISTING ZONING CAPACITY	EXISTING GENERAL PLAN CAPACITY	ZONING CAPACITY IN EXCESS OF PLAN CAPACITY
Central Los Angeles	2,834,900	1,508,900	1,326,000
Western Los Angeles	1,092,000	848,800	243,200
San Fernando Valley	1,815,800	1,443,300	372,500
Southern Los Angeles	400,600	252,900	147,700
GRAND TOTAL	6,143,300	4,053,900	2,089,400

Table GS-27. Comparison of adopted 1990 dwelling unit capacities to 1975 dwelling units in San Fernando Valley.

COMMUNITY PLANNING AREA	1975 DWELLING UNITS[1]	1990 DWELLING UNIT CAPACITIES[2]	INCREASE 1970 TO 1990	PERCENTAGE INCREASE
PLAN CAPACITY[3] EXCEEDS CURRENT ZONING CAPACITY				
Chatsworth-Porter Ranch	17,883	35,510	17,627	98.5%
Canoga Park-Winnetka-Woodland Hills	40,388	66,000	25,612	63.4%
Granada Hills-Knollwood	16,396	22,184	5,788	35.3%
Northridge	13,107	20,144	7,037	53.6%
Sylmar	11,327	21,755	10,428	92 %
EXISTING ZONING[3] EXCEEDS PLAN CAPACITY				
Encino-Tarzana	24,359	31,355	6,996	28.7%
Mission Hills-Panorama City-Sepulveda	33,599	38,116	4,517	13.4%
North Hollywood	38,440	56,229	17,789	46.2%
Reseda-West Van Nuys	27,017	35,628	8,611	31.8%
Sherman Oaks-Studio City-Toluca Lake	35,868	41,488	5,620	15.6%
ADOPTED PLANS TOTALS	258,384	368,409	110,025	42.5%

[1] Department of City Planning, City of Los Angeles, 1975.

[2] Individual Community Plans.

[3] See Table GS-26.

c. **Population Distribution**. Population growth constitutes demand for residential, commercial, and service activities, and wastewater treatment is one important service. Population projections for the City of Los Angeles have been proposed by several agencies involved in estimating future requirements for community services.

(1) POPULATION PROJECTIONS. Population projections have been prepared for the City of Los Angeles by the California Department of Finance (DOF) and the Southern California Association of Governments (SCAG). For the Hyperion Service Area, these are given in Table GS-12 (pg. 105). Each projection scenario reflects a particular combination of assumptions regarding birth rates, death rates, and net migration.

SCAG does not generate projections but rather reallocates the DOF projections within their six-county study area.

The redistribution of population by SCAG is based on a series of policy considerations. These policies are:

- Encourage growth in and adjacent to existing urban areas.
- Avoid excessive housing recycle and resulting community disruption.
- Avoid densities that would overtax the existing and currently planned infrastructure.
- Preserve, whenever possible, the region's natural resources and desirable land uses, particularly prime agricultural lands.
- Balance population with jobs within each major subregion.
- Support the policies of SCAG's Regional Transportation Plan.

(2) ALTERNATIVE GROWTH SCENARIOS. A Baseline year consistent with 1974 existing conditions and a projected year, the SCAG-76 projections for 1990, were mapped to present a baseline year and the expected growth. Alternative growth and population distribution scenarios have been developed to analyze future population, land use, vehicle miles traveled (VMT) and air quality to establish the impacts accommodated by the project. The relationship of these scenarios to the major EIS alternatives, and the policies necessary for each scenario are presented in the scenario descriptions below. The model used in the projections is described in Appendix II-A.

The following scenarios were prepared and processed to determine the relative impact of alternative Facilities Plan major projects.

SCENARIO 1. PLANNED GROWTH. Current facilities planning efforts are directed toward accommodating SCAG-76 population totals and distribution. This scenario is the SCAG-76 projection with an approximate total of 7 percent growth in the service area for the planning period. Some growth will occur in all areas of the City but the West Valley will receive the greatest increase, a total of 22 percent above estimated 1974 levels. This growth scenario is consistent with the alternatives including Inland/Coastal Split (alternative B4C), Coastal with AVORS (alternative C3), and Maximum Reclamation (alternative E2).

SCENARIO 2. VALLEY GROWTH DISPLACED TO THE SOUTHERN HALF OF THE CITY. This scenario is that projected under alternative CX. The SCAG-76 growth totals are reallocated so that no growth occurs within the San Fernando Valley and all growth that would have located in the Valley is allocated within the Hyperion Service Area, south of the mountains. This scenario would involve policy decisions that include failure of the mitigation strategies for minimizing secondary air quality impacts, failure to institute maximum reclamation, construction of SCAG-76 capacity requirements at Hyperion only, and no Valley hydraulic relief.

SCENARIO 3. NO SERVICE AREA GROWTH. This scenario projects the emissions and air quality in the Hyperion service area if no growth were to occur in the service area. For 1990 emissions are reduced and air quality is improved because of the ongoing air improvement efforts (e.g., pollution control devices on cars). This scenario is used as a No Project comparison to investigate the impacts of the growth accommodated by the Facilities Plan alternatives B4C, C3 and E2. No Project (A1) is not proposed as an actual alternative for possible implementation.

All three scenarios apply to the Hyperion Service Area, but scenarios 1 and 3 were also applied to the entire South Coast Air Basin (SCAB) to determine the regional impacts of growth versus no-growth.

	HTP SERVICE AREA	SCAB
Scenario 1	SCAG-76 growth	SCAG-76 growth
Scenario 2	Displaced Valley growth	
Scenario 3	No growth	No SCAB growth
		No HTP growth only

The project-related secondary impacts are the differences in predicted conditions between the Hyperion Service Area with planned growth and with no growth. Impacts of sewer service expansion are identified at the local level by comparing existing conditions (1974, no growth conditions) to the conditions resulting from Scenario 2 (alternative CX), where growth is displaced from the San Fernando Valley into other areas of the City.

The baseline characteristics of the Hyperion Service Area are presented in terms of difference between present (1974) and projected (1990) population and utility needs are projected using the 10 kilometer grid used throughout this report.

Table GS-28 presents the difference between existing and SCAG-76 projections for population, residential needs, area requirements and services, including wastewater flow. This growth is accommodated by the Facilities Plan alternatives B4C, C3, and E2. Table GS-29 presents the difference between the existing and the CX population distribution.

d. Transportation and Circulation. Further development or redevelopment of land within the service area will result in increased vehicle traffic. This will increase traffic congestion and travel times on surface streets. Assuming Caltrans proceeds to implement its bottleneck widening and ramp metering programs throughout the urbanized portion of the basin, then all freeways should operate at optimum efficiency, even during the peak hours. This can only be accomplished by longer delays at onramps or diverting vehicles to alternate surface street routes. Therefore, the greatest impact will be felt on city surface streets, particularly the major arterials.

Of the freeways that provide circulation within the Hyperion Service Area, Routes 2, 118, and 210 are incomplete, leaving gaps in the system.

Substantial portions of the following freeways are now operating at full capacities so that no increase in peak hour traffic volume can be accommodated without additional freeway or mass transit expansions:

Golden State Freeway	Highway 5
Hollywood Freeway	Highway 101
Harbor Freeway	Highway 11
San Diego Freeway	Highway 405

These crowded freeways could act as a short-term deterrent to residential growth in the San Fernando Valley, though they could actually induce Valley growth by making employment and industry relocation to the Valley more desirable. Unused freeway capacity is found mostly in the eastern part of the basin and in the Valley north of the Santa Monica Mountains.

The freeway holding capacity for the San Fernando Valley is estimated to be 1,440,000 persons based on the following assumptions:

- 1974 population of modeling region 1,200,000
- Daily demand out of Valley is 517,000 vehicle trips per day
- The PM peak hours (4-6 P.M.) represent 9 percent of the daily trips
- Maximum freeway capacity is 2,000 vehicles per lane-hours
- Fourteen lanes will be available to travel

Table GS-28. Difference between Baseline 1974 and SCAG-76 (alternatives B4C, C3, E2 in 1990) projected population and service area needs.

FACTOR	ZONE												
	11	16	17	18	23	24	25	30	31	32	33	35	TOTAL
Population (thousands)	8	22	15	27	10	25	16	57	13	11	5	20	229
Single-Family Units (thousands)	-2	-2	-8	-7	5	-2	-6	15	6	3	4	8	14
Multi-Family Units (thousands)	18	15	24	26	0	18	19	11	4	8	0	-1	142
Acres Req.— Single-family	-500	-500	-2000	-1750	1250	-500	-1500	3750	1500	750	1000	2000	3500
Acres Req.— Multi-family	900	750	1200	1300	0	900	950	550	200	400	0	-50	7100
Acres Req.— Total	400	250	-800	-450	1250	400	-550	4300	1700	1150	1000	1950	10600
Elem. Pupils	-500	-650	-4400	-3600	3500	-500	-3250	11050	4400	2500	2300	5550	16900
Elem. Classrooms	-17	-22	-147	-120	117	-17	-108	368	147	83	93	185	563
Jr. High Pupils	-60	-150	-1680	-1320	1500	-60	-1230	4830	1920	1140	1200	2370	8460
Jr. High Classrooms	-2	-4	-48	-38	43	-2	-35	138	55	33	34	68	242
Sr. High Pupils	40	-50	-1280	-970	1250	40	-930	4080	1620	990	1000	1970	7760
Sr. High Classrooms	1	-1	-37	-28	36	1	-27	117	46	28	29	56	222
Electricity in MWHD	0.21	0.57	0.39	0.70	0.26	0.65	0.42	1.48	0.34	0.29	0.13	0.52	5.95
Natural Gas in MCFD	1.36	3.74	2.55	4.59	1.70	4.25	2.72	9.69	2.21	1.87	0.85	3.40	38.93
Water in MGD	1.36	3.74	2.55	4.59	1.70	4.25	2.72	9.69	2.21	1.87	0.85	3.40	38.93
Wastewater in MGD	1.01	2.77	1.89	3.40	1.26	3.15	2.02	7.18	1.64	1.39	0.63	2.52	28.85
Solid Waste in KTD	41	112	77	138	51	128	82	291	66	56	26	102	1168
Hospital Beds	18	50	34	61	23	57	36	130	30	25	11	45	520
Recreation Area, Acre	16	44	30	54	20	50	32	114	26	22	10	40	458
Fires	28	76	52	93	35	86	55	197	45	38	17	69	790
Firefighters	8	23	16	29	11	27	17	60	14	12	5	21	243
Policepersons	21	57	39	70	26	65	42	148	34	29	13	52	595
Felonies	1	2	1	3	1	2	2	6	1	1	0	2	23

Table GS-29. Difference between Baseline 1974 and population characteristics associated with the Facilities Plan CX alternatives. (All LA City growth occurs south of the mountains).

FACTOR	ZONE												TOTAL
	11	16	17	18	23	24	25	30	31	32	33	35	
Population (thousands)	37	3	15	11	16	10	14	-57	-13	-11	-5	-20	0
Single-family Units (thousands)	8	5	7	5	2	4	5	-15	-6	-3	-4	-8	0
Multi-family Units (thousands)	3	4	4	4	1	4	3	-11	-4	-8	0	0	0
Acres Req.— Single-family	2000	1250	1750	1250	500	1000	1250	-3750	-1500	-750	-1000	-2000	0
Acres Req.— Multi-family	150	200	200	200	50	200	150	-550	-200	-400	0	0	0
Acres Req.— Total	2150	1450	1950	1450	550	1200	1400	-4300	-1700	-1150	-1000	-2000	0
Elem. Pupils	5750	3700	5100	3700	1450	3000	3650	-11050	-4400	-2500	-2800	-5600	0
Elem. Classrooms	192	123	170	123	48	100	122	-368	-147	-83	-93	-187	0
Jr. High Pupils	2490	1620	2220	1620	630	1320	1590	-4830	-1920	-1140	-1200	-2400	0
Jr. High Classrooms	71	46	63	46	18	38	45	-138	-55	-33	-34	-69	0
Sr. High Pupils	2090	1370	1870	1370	530	1120	1340	-4080	-1620	-990	-1000	-2000	0
Sr. High Classrooms	60	39	53	39	15	32	38	-117	-46	-28	-29	-57	-0
Electricity in MWHD	0.96	0.08	0.39	0.29	0.42	0.26	0.36	-1.48	-0.34	-0.29	-0.13	-0.52	0.00
Natural Gas in MCFD	6.29	0.51	2.55	1.87	2.72	1.70	2.38	-9.69	-2.21	-1.87	-0.85	-3.40	0.00
Water in MGD	6.29	0.51	2.55	1.87	2.72	1.70	2.38	-9.69	-2.21	-1.87	-0.85	-3.40	0.00
Wastewater in MGD	4.66	0.38	1.89	1.39	2.02	1.26	1.76	-7.18	-1.64	-1.39	-0.63	-2.52	0.00
Solid Waste in KTD	189	15	77	56	82	51	71	-291	-66	-56	-26	-102	0
Hospital Beds	84	7	34	25	36	23	32	-130	-30	-25	-11	-45	0
Recreation Area, Acre	74	6	30	22	32	20	28	-114	-26	-22	-10	-40	0
Fires	128	10	52	38	55	35	48	-197	-45	-38	-17	-69	0
Firefighters	39	3	16	12	17	11	15	-60	-14	-12	-5	-21	0
Policepersons	96	8	39	29	42	26	36	-148	-34	-29	-13	-52	0
Felonies	4	0	1	1	2	1	1	-6	-1	-1	-0	-2	0

This calculation indicates that the Valley is nearly at the freeway holding capacity. The holding capacity of the Valley based on surface street arterials is estimated to be 2,580,000 or about twice the present population. See the main text for further details. However, although the mountain pass streets and freeways from the Valley to the southern part of the City are at maximum vehicle capacity during peak hours, there is additional capacity for people. Additional people could be moved across the mountains any of three ways that do not require expanding roadways:

(1) the peak hours could lengthen as people try to get an early start on the rush hours

(2) vehicle occupancy could increase through carpooling

(3) increased bus transit could remove vehicles from the highways during the peak hours (see Section II-E for a discussion of proposed preferential treatment of freeways for buses and carpools).

e. Constraints to Growth. Table GS-30 presents a summary of the existing Utilities and Land Use Characteristics and specifies the potential constraints to growth by major subdivision within the City of Los Angeles.

3. AIR QUALITY IMPACTS OF GROWTH

a. Introduction. The continuing growth of the City of Los Angeles, facilitated by the additional wastewater treatment capacity also produces air pollution from a variety of activities including automobile travel, fuel combustion, and industrial production. Significant factors include:

- The major contributors to air pollution in Los Angeles are motor vehicles.
- Based on existing emissions trends and control policies, the study area's air is likely to remain polluted, and transport of polluted air masses from Los Angeles will continue to affect other areas downwind.
- Air pollutant concentrations (oxidants, particulate matter, carbon monoxide, and nitrogen dioxide) in the study area now exceed state and federal standards established to protect public health.
- Forests in Southern California have been exposed to damaging concentrations of photochemical oxidants for 25 years. This has resulted in extensive damage to the forests of the Angeles, San Bernardino, and Los Padres National Forests.
- Most important, the air quality impacts without mitigation of population growth accommodated by project alternatives B4C, C3 and E2 will significantly hinder the attainment of air quality standards.

Table GS-30. Potential growth factors constraining the City of Los Angeles by major geographic region.

COMMUNITY SERVICE	GEOGRAPHIC AREA				
	CITY TOTAL	CENTRAL	VALLEY	WEST	HARBOR
Electricity	Not a constraint Peak demand currently approximately 66% of peak capacity	Not a geographic constraint	Not a geographic constraint; High per capita use	Not a geographic constraint	Not a geographic constraint
Natural Gas	Significant shorter gas possible in future without LNG. Conversion of new development to electricity likely	Not a geographic constraint	Not a geographic constraint; High per capita use	Not a geographic constraint	Not a geographic constraint
Water Supplies	Not a constraint - existing sufficient to meet needs	Not a geographic constraint	Not a geographic constraint; High per capita use	Not a geographic constraint	Not a geographic constraint
Wastewater Treatment	Not a constraint Assuming secondary treatment constructed Per capita flows higher during week days due to employment and commercial centers.	Not a constraint assuming secondary treatment constructed	Uncertain; not presently a constraint but without hydraulic relief employment centers and multi-family residential development will be constrained within planning period	Not a constraint assuming secondary treatment constructed	Not a constraint improved Terminal Island facilities committed
Solid Waste Disposal	A potential constraint; available landfill sites rapidly reaching capacity; Higher costs likely in future	Not a geographic constraint	Not a geographic constraint	Not a geographic constraint	Not a geographic specific constraint
Other Services	Not a constraint	Not a constraint; lacks public recreation opportunities	Not a constraint; some pressure on educational institutions	Not a constraint; lacks public recreation other than beach areas	Excess capacity in many areas
Transportation and Circulation	Currently a constraint based upon rider occupancy rates and peak load	A constraint; major arterials at an exceeding peak hour capacity	Uncertain;over the mountain routes at or exceeding peak hour capacity; north and east valley routes not at capacity; could encourage employment center migration to valley with concommitant growth	A constraint; major arterials at or exceeding peak hour capacity	Not exceeding capacity
General Plan	Not a constraint; Not completed and advisory only	Not a constraint; fewer than 20% adopted	Not a constraint; within planning period nearly 80% adopted that permits a 43% increase over present	Not a constraint Fewer than 50% adopted	Not a constraint fewer than 40% adopted
Existing Zoning	Not a constraint Zoning is 1.5 times G.P. capacity	Not a constraint zoning is 2.0 times G.P. capacity	Not a constraint zoning is 1.3 times G.P. capacity	Not a constraint zoning is 1.3 G.P. capacity	Not a constraint zoning is 1.6 G.P. capacity
Land Availability	Not a constraint Approximately 12% of land available for development	Cost constraint Only 1 percent of land open or currently being recycled	Not a constraint Over 23 percent open and available	Potential constraint approximately 6% available for development	Not a constraint over 10% available for development
SUMMARY	Not regionally constrained, except in solid waste disposal and somewhat in trasportation	Constrained by transportation and available land	Potentially constrained by wastewater treatment availability	Constrained by transportation and somewhat constrained by available land	Not constrained

To determine the effect of the changing emissions levels of reactive hydrocarbons and oxides of nitrogen on air quality, it was necessary to formulate a model that linked emissions, meteorology, and pollutant concentration. Much effort and time has been spent in this formulation by many investigators (Ball, 1973). Results have been mixed with no model being generally accepted or readily adaptable to the present subregional analysis goals.

b. Model Description. The essential elements of any air quality model are source emissions data, meteorological inputs characterizing transport and diffusion processes, and information concerning chemical transformations and removal processes.

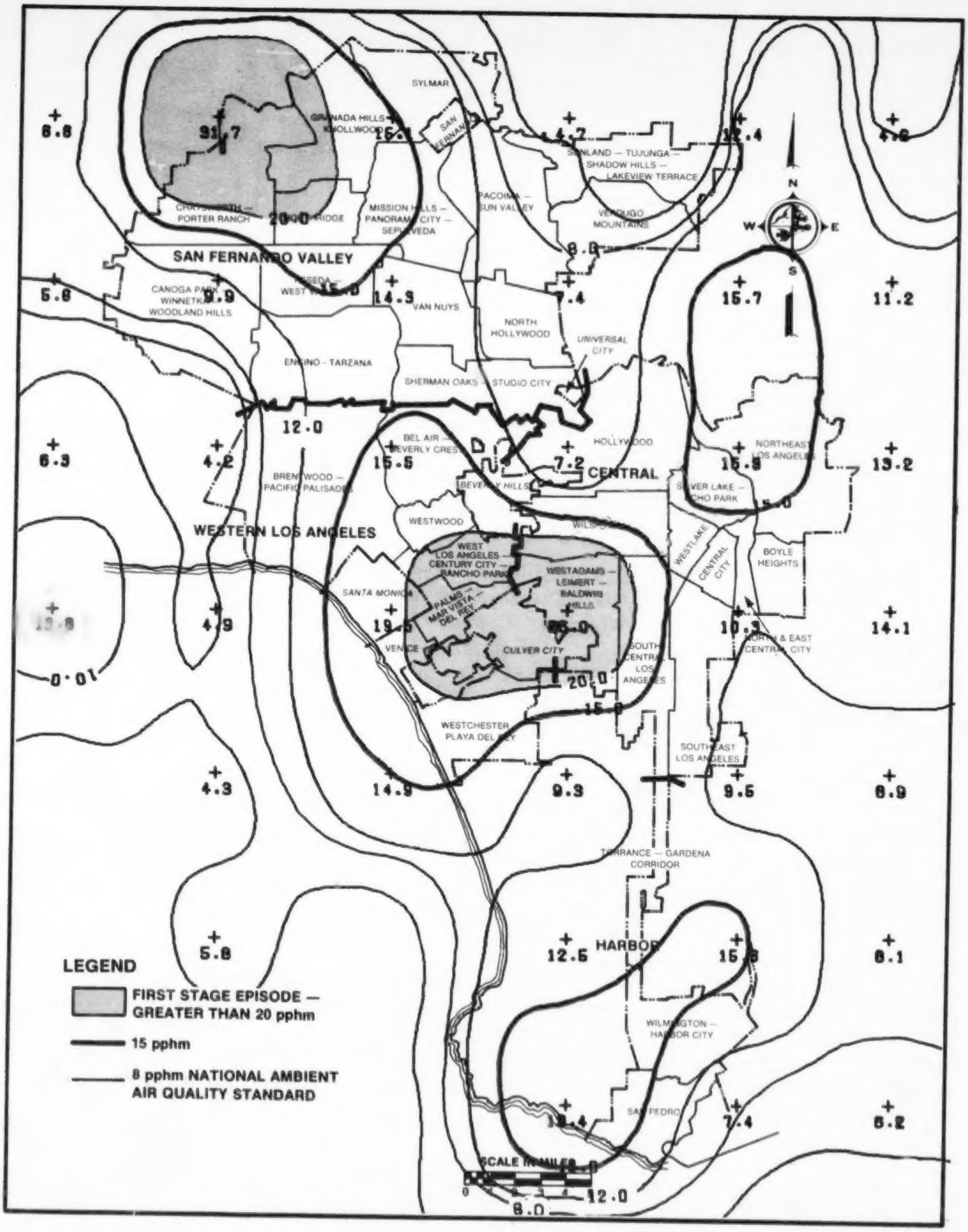
The population data used in conjunction with stationary source inventories is the same as that used in the vehicle emissions model. The 45 zones identified and the zone approximation to the service area used in this analysis standardizes the data so the the mobile and stationary analyses could be meshed. The specific zones used to represent the service area are given with their 1974 and 1990 populations (as projected by SCAG-76) in Appendix II-B.

To provide a relative distribution rather than the photochemistry of pollutants, an air pollution model based on early work by Hanna and Gifford (Gifford and Hanna, 1970; Hanna, 1971) was combined with an empirical aerometric model developed for Los Angeles by Chevron Research (Mertz, Painter, and Ryason, 1975). A basinwide wind transport scheme was synthesized into the model for this study.

c. Baseline Air Quality (No Growth). Figure GS-51 presents the 1974 air quality conditions used for relative impact analysis. The mobile and fixed emissions associated with 1974 populations and distribution are projected into the future and the relative air quality of this future scenario is given in Figure GS-52. Figure GS-52 represents a no growth baseline condition for the entire South Coast Air Basin.

As can be seen from Figure GS-52, the NAAQS of 8 pphm would not be met in the majority of the basin even under this basinwide no project/no growth scenario. For the Hyperion Service Area, the maximum oxidant levels would generally still be expected to exceed 8 pphm. About 60 percent of the total service area would be expected to have values over 8 pphm on a typical smoggy day with about 20 percent of the area having 15 pphm or higher.

d. Requirements to Meet Standards. A contour map of oxidant levels for a 90 percent reduction in overall emissions from the 1974 inventory is shown in Figure GS-53. This model was run to estimate the effect of a massive emissions change, since at present such a decrease seems to be required to ensure meeting the NAAQS of 8 pphm throughout the basin. The figure shows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FIRST STAGE EPISODE – GREATER THAN 20 pphm
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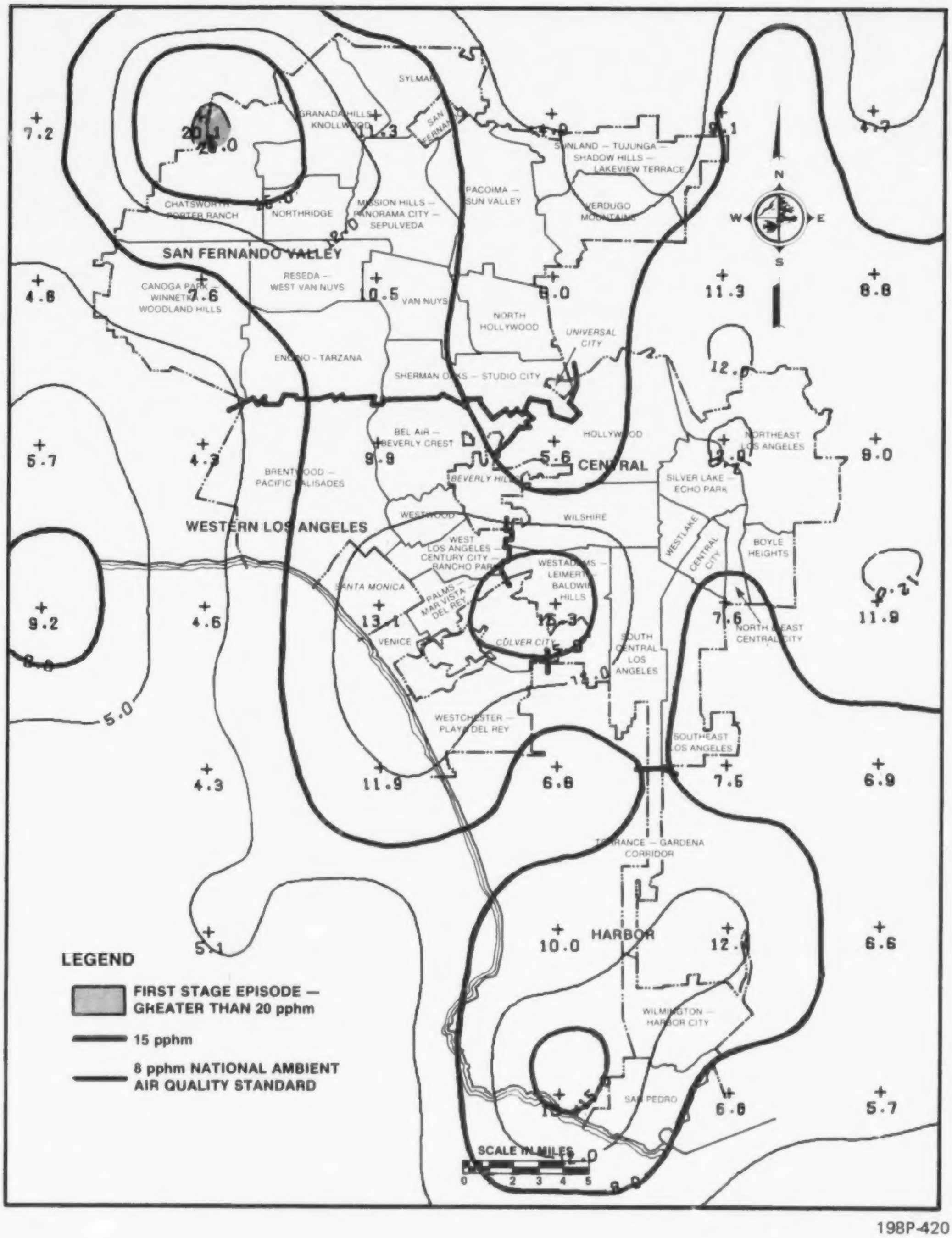
8 pphm NATIONAL AMBIENT AIR QUALITY STANDARD

198P-62

Figure GS-51. 1974 oxidant isopleth map generated by Aerometric Model.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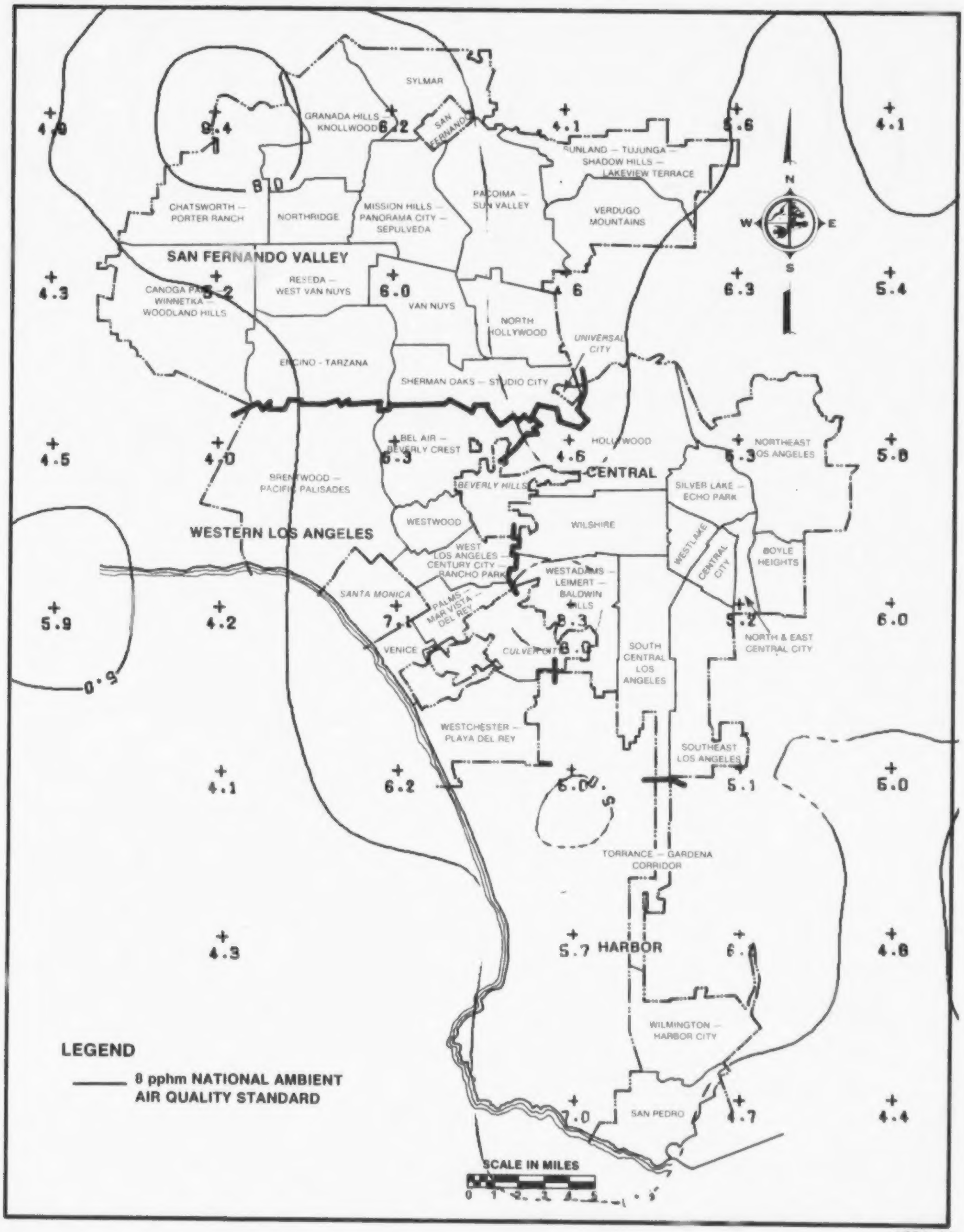
198P-420

Figure GS-52. Oxidant distribution for no population growth in the service area from 1974 to 1990.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SCALE IN MILES
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Figure GS-53. Estimated 1990 air quality for emission levels that represent a 90 percent reduction from the 1974 base.

that in most areas of the City, the required air quality could be achieved with such a tremendous emissions cutback. Even with a 90 percent cutback, some areas of the western San Fernando Valley and a small portion of the Central City would still be expected to exceed the standards in 1990.

This figure demonstrates that a "No Project" decision combined with an immediate and complete moratorium on all new development within the South Coast Air Basin and a stringent antipollution campaign tantamount to a police state over the entire South Coast Air Basin would be required to reduce emissions by 90 percent to meet NAAQS requirements by 1990.

e. Alternative with Displaced San Fernando Valley Growth. Figure GS-54 shows the projected air quality conditions for 1990 if San Fernando Valley growth is limited by implementation of alternative CX.

f. Alternatives Permitting Planned Growth. Alternatives B4C, C3, and E2 provide for adequate wastewater treatment in all portions of the Hyperion Service Area and permit growth in accordance with SCAG-76 projections. The air quality effects associated with this growth scenario are given in Figure GS-55. Section h. discusses the number of days expected to exceed NAAQS and first and second stage episode levels.

A comparison of Figures GS-51 and GS-55 demonstrate that air quality conditions under the viable alternatives will be considerably superior to the present. This is due chiefly to the technological advances in mobile emissions control. A comparison of Figures GS-52 and GS-55 demonstrate that unmitigated air quality conditions, particularly in the western end of the San Fernando Valley but also in the Central City area, are relatively worse under the feasible project alternatives than under the no growth scenario. The project alternatives facilitate emission increases of 12 percent of reactive hydrocarbons and 14 percent nitrogen oxides over the 1990 no growth scenario.

g. Comparison of Basinwide Stationary and Mobile Emissions. The "no growth in the service area" scenario shown in Figure GS-56 assumes that the population level does not change from 1974 to 1990. The per capita generation rate for emissions, however, changes at the presently projected rates. The emissions for this no growth scenario show a 12.6 percent reduction in overall reactive hydrocarbon emissions and a 14.6 percent reduction in oxides of nitrogen compared to presently projected 1990 values. Even under this scenario, the hydrocarbon level is still about 3.5 times as high as the estimated 256 tons per day (TPD) limit required to meet national ambient air quality standards.

The basinwide difference in NO_x and hydrocarbon emissions between the service area scenario for no growth in population (essentially no growth in Los Angeles) and the SCAG-76 policy in 1990 can be seen in Figure GS-57. The Hyperion Service Area in 1990 with SCAG-76 growth will contribute a total

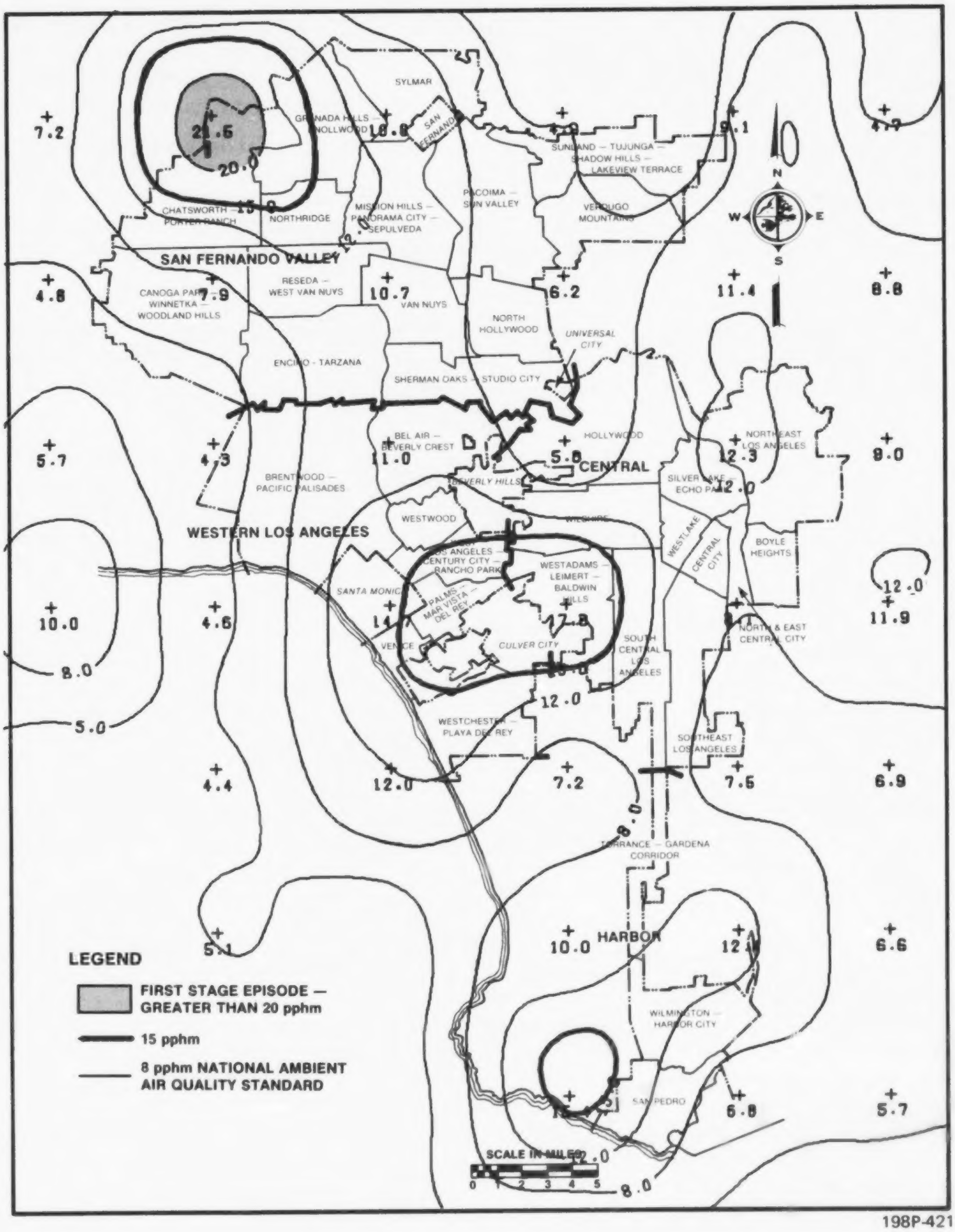
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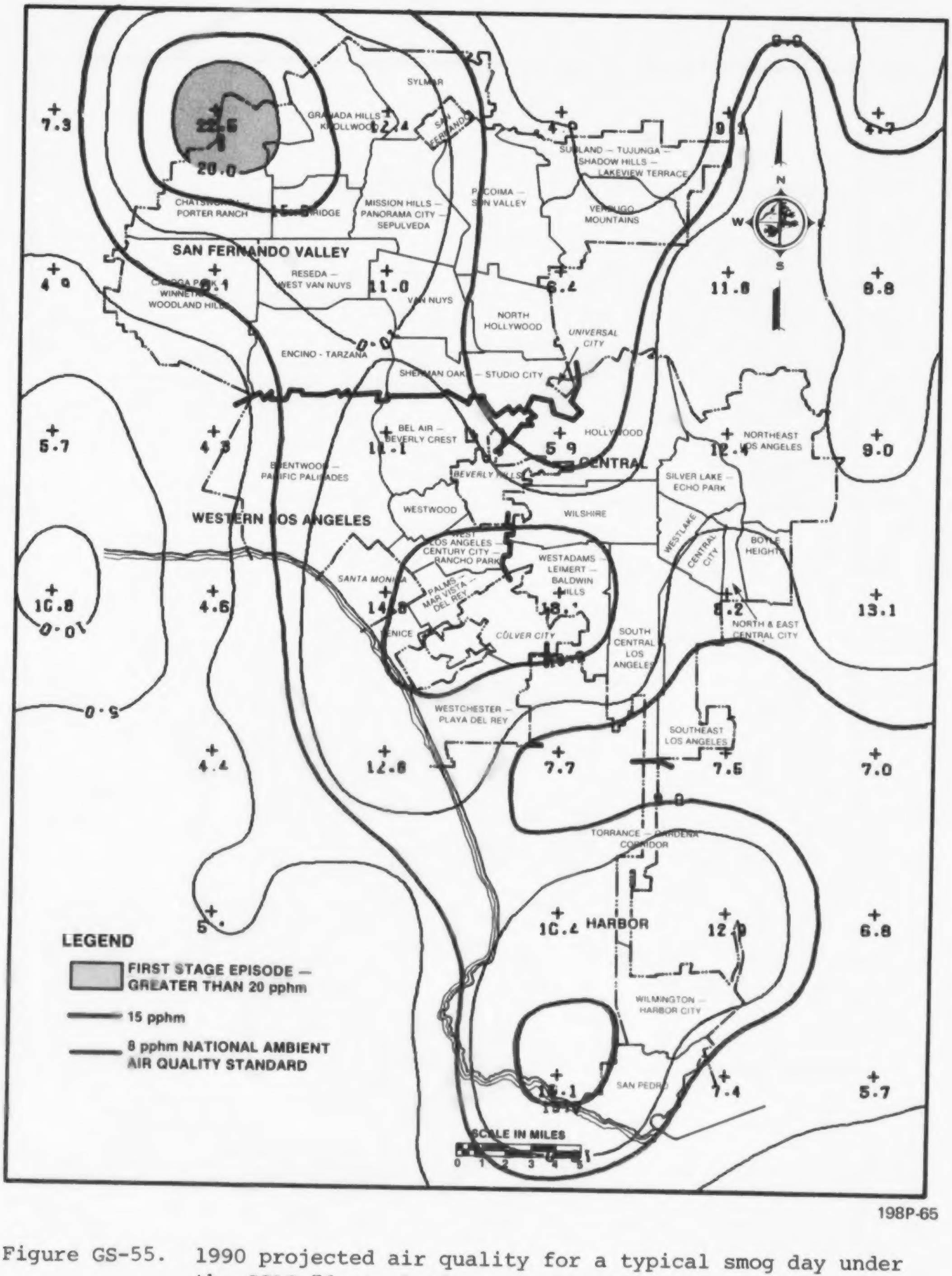
Figure GS-54. Oxidant map for limited growth in the San Fernando Valley—alternative CX (scenario 2).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15 pphm
8 pphm NATIONAL AMBIENT AIR QUALITY STANDARD

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Figure GS-55. 1990 projected air quality for a typical smog day under the SCAG-76 population growth policy.

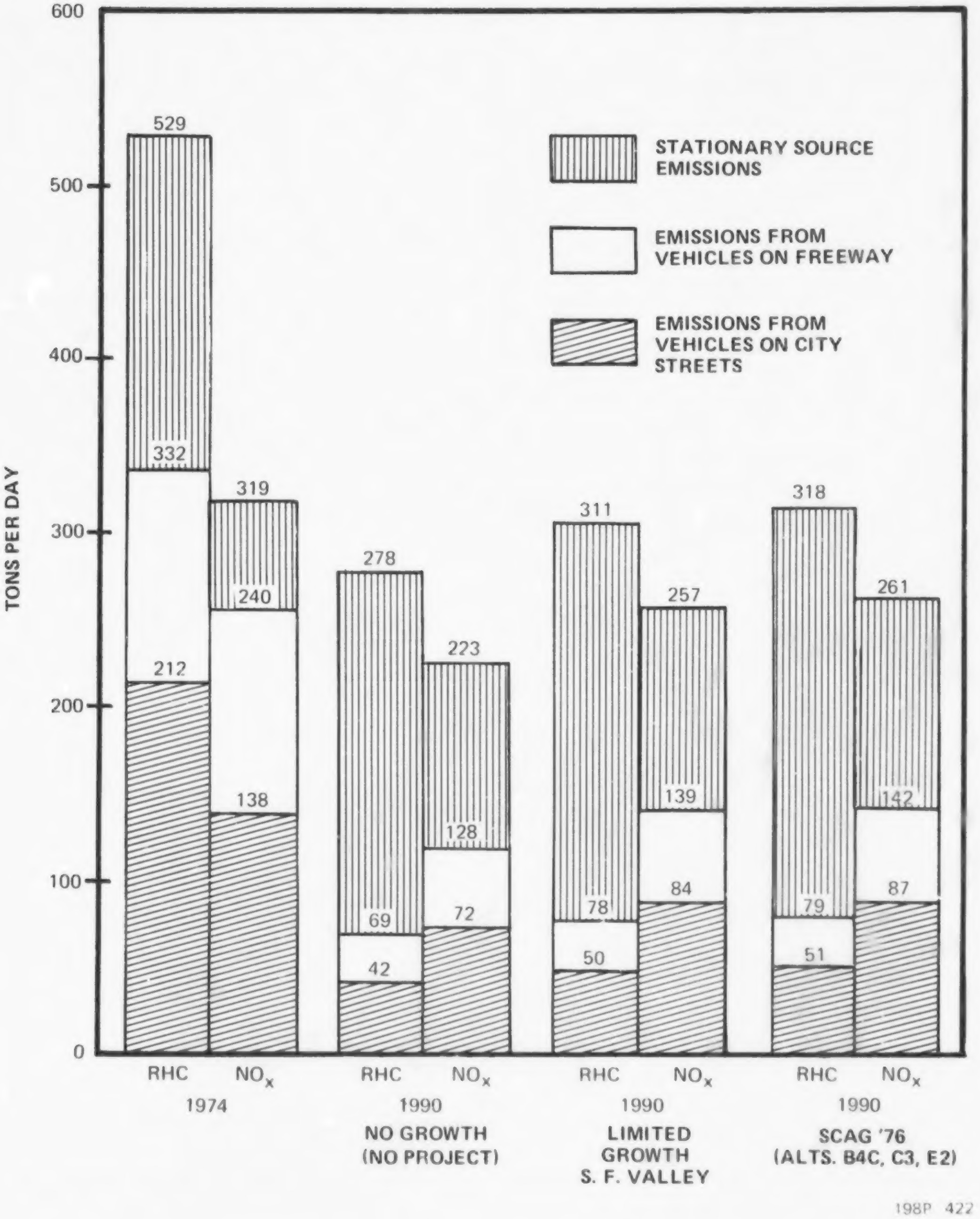

Figure GS-56. Hyperion Service Area emissions for 1974, no project, and various project alternatives.

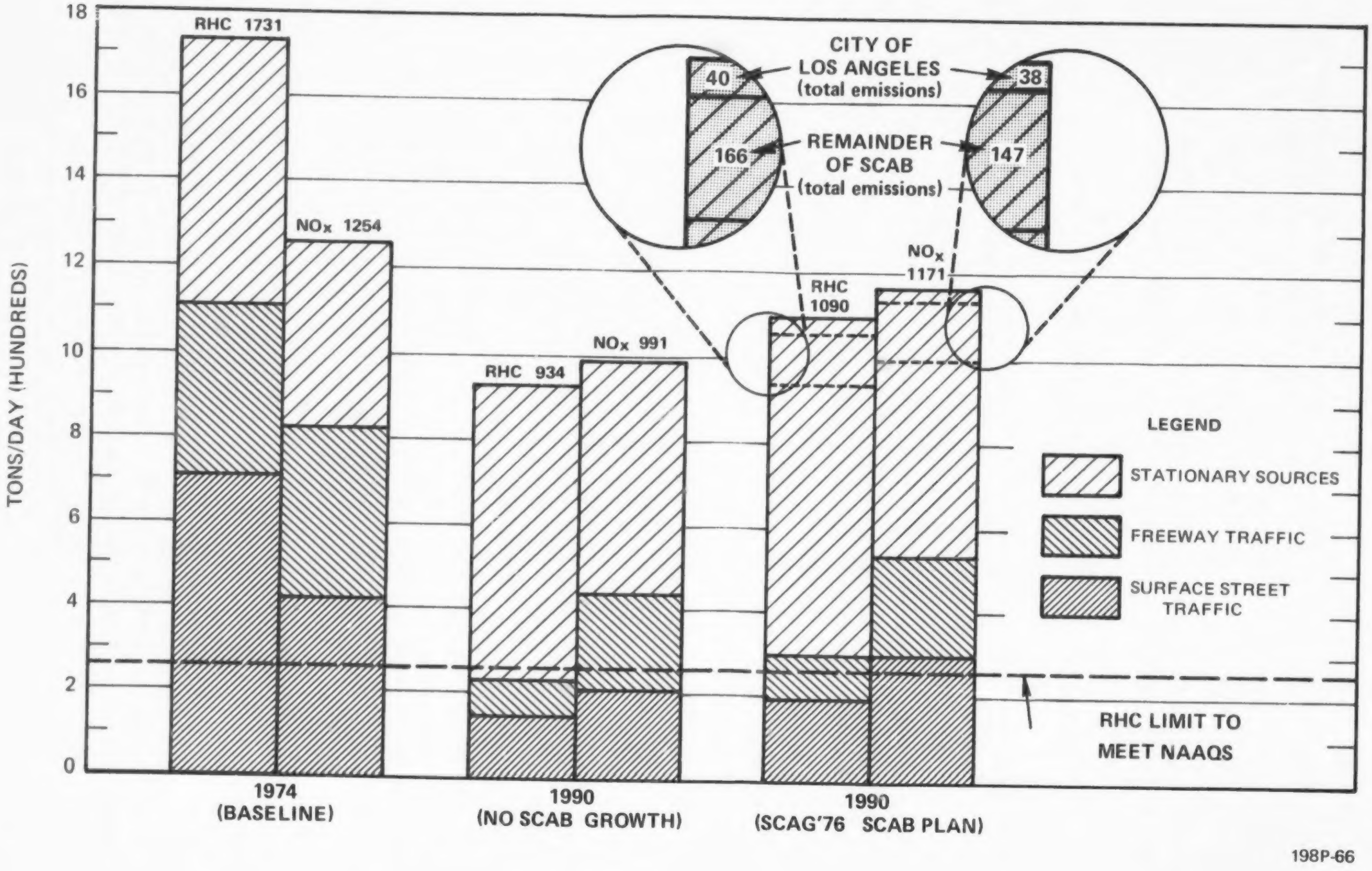

Figure GS-57. ARB projected emissions for South Coast Air Basin (SCAB).

of 318 tons per day of mobile and stationary reactive hydrocarbons or 29 percent of the South Coast Air Basin total. Total nitrogen oxides from mobile and stationary sources within the service area are expected to be about 261 tons per day or 22 percent of the South Coast Air Basin total in 1990. Table GS-31 shows the differences in oxidant levels between the no growth and SCAG-76 growth levels for different areas. Table GS-32 also compares emissions for the various scenarios.

Table GS-31. Maximum 1990 oxidant levels (pphm).

ZONE	NAME	SCAG-76 GROWTH	HYPERION NO GROWTH (12% RHC REDUCTION) (14% NO$_x$ REDUCTION)	% REDUCTION IN OXIDANT LEVEL MAXIMUM
-11	Hawthorne	7.7%	6.8%	11.7%
-16	Santa Monica	14.8	13.1	11.5
-17	Culver City	18.0	16.3	9.4
-18	Downtown Los Angeles	8.2	7.6	7.3
23	Sherman Oaks	11.1	9.9	10.8
-24	West Hollywood	5.9	5.6	5.1
-25	Glendale	12.4	12.0	3.2
30	Tarzana	8.1	7.6	6.2
31	Sepulveda	11.0	10.5	4.5
32	Burbank	6.2	6.0	3.2
33	La Crescenta	11.8	11.3	4.2
35W	Chatsworth	22.5	20.5	8.9
35E	San Fernando	12.4	11.3	8.9
	Average	11.5%	10.7%	7.0%

h. Exposure Indices. The area representations of air quality can be converted to estimates of the number of days that a specified limit will be exceeded by using an approach developed by Larsen (Larsen, 1971). Table GS-33 shows the estimated number of days over established standards for three representative locations within the service area. The baseline values are given for 1974 and 1990. The estimated 126 days over the 8 pphm standard for no growth is 23 percent better than the projected effect with full SCAG-76 growth.

Table GS-32. Basinwide (SCAB) trips, VMTs, and vehicle emissions for various growth scenarios.

YEAR	GROWTH SCENARIO	LOW TRANSIT					HIGH TRANSIT			
		TRIPS x 10^6	VMT x 10^6	RHC TPD	NO_x TPD	CO TPD	VMT x 10^6	RHC TPD	NO_x TPD	CO TPD
1974	Present	17.6	175.2	1,106	824	8,145	--	--	--	--
1990	I—No growth baseline (basinwide or region):									
	No growth in SCAB	17.6	175.2	231	439	1,393	132.6	172	349	984
	No growth in Hyperion Service Area growth	20.8	211.3	281	520	1,715	161.0	210	414	1,234
1990	II—Coastal (without valley hydraulic relief alternative CX):									
	No San Fernando Valley growth	21.2	213.9	284	527	1,740	163.0	213	419	1,250
	Shifted San Fernando Valley growth to South City	21.5	216.3	288	532	1,761	164.8	215	423	1,266
	Displaced San Fernando Valley growth (to SCAB)	21.5	217.3	289	534	1,770	165.6	216	425	1,273
	Clustered growth in CBD (Central Bus. District)	21.4	215.2	286	530	1,750	163.9	214	421	1,258
1990	III—Inland/Coastal, Coastal/AVORS, and maximum reclamation projects (with valley hydraulic relief, alternatives B4C, C3 and E2):									
	SCAG-76 Forecast	21.5	217.0	289	534	1,766	165.2	216	424	1,270
	San Fernando Valley and CBD clusters	21.4	216.2	287	531	1,758	164.5	215	422	1,264
	Clustered growth in San Fernando Valley	21.5	217.4	289	534	1,768	165.4	216	424	1,271

Regional population exposure levels for the main scenarios are presented in Table GS-34. The best condition is an extreme 90 percent reduction from 1974 levels in all emissions throughout the basin. It is interesting to note that this drastic emissions cutback still results in an estimate of 15 days per year over the National Standard and probably one second stage smog episode in 1990. The no growth baseline scenario for the service area provides some improvement in air quality. Also shown are possible emissions control scenarios presented in the mitigation measures.

From the comparisons in these two tables, it is apparent that emissions control efforts in 1990 must include active mitigation. Mitigation efforts should be aimed at significant emissions reductions in specific areas of the

Table GS-33. Number of days standards would be exceeded in the South Coast Air Basin for specified emissions control scenarios. The increase from the 1990 no growth emissions to the SCAG-76 1990 emissions is the amount requiring mitigation.

SCENARIO	8 PPHM[1]			20 PPHM[2]			35 PPHM[3]		
	GRANADA HILLS	BURBANK-NORTH HOLLYWOOD	WEST L.A.-CULVER CITY	GRANADA HILLS	BURBANK-NORTH HOLLYWOOD	WEST L.A.-CULVER CITY	GRANADA HILLS	BURBANK-NORTH HOLLYWOOD	WEST L.A.-CULVER CITY
Model Base	290	104	219	44	9	27	9	1	4
Observed—1974	215	215	215	89	89	89	3	3	3
SCAG-76 Baseline—1990 (Alternatives C3, B4C, E2)	164	22	104	18	1	8	3	3	3
No Population Growth in the Service Area (1990)	126	11	77	11	1	5	2	1	1

[1] NAAQS.

[2] First stage episode.

[3] Second stage episode.

Table GS-34. Regional population exposure levels in units of 10 people—parts per million—days and percentage of baseline. The difference between the no growth 1990 exposure and the 1990 SCAG-76 exposure is the amount requiring mitigation.

SCENARIO	8 PPHM			20 PPHM		
	RPEL	PERCENT OF BASELINE		RPEL	PERCENT OF BASELINE	
		1974	1990		1974	1990
1974 Base (actual)	17.206	100	—	5.280	100	—
SCAG-76 1990 Base (alternatives B4C, E2, and C3)	7.508	—	100	1.613	—	100
90 percent SCAB Emissions Reduction from 1974	0.766	5	10	0.236	5	15
30 percent Reduction in SCAB RHC from Projected 1990 Levels	5.420	—	72	0.900	—	56
No Population Growth in the Service Area	5.444	32	73	0.821	16	51

SCAB. The service area, for example, contains many industrial emission sources, a large population, and a freeway system that all contribute to basinwide air pollution problems. Specific mitigation measures for each of these major emissions groups can be implemented.

i. Summary and Conclusions. All of the emission projections were prepared for the year 1990. If it is assumed that the relationship between total population and total service area emissions is the same for 2000 as for 1990, emission projections can be made for the entire Facilities Planning period. Table GS-35 shows these emission figures. The increase in emissions with SCAG-76 growth over the projected no growth condition is considered to be the project impact requiring mitigation.

Table GS-35. Emission levels in service area requiring mitigation.

	PROJECTED LEVELS	
	RHC	NO_x
No Growth, Emissions, 1990 or 2000 (TPD)	278	223
SCAG-76 Growth, Emissions for 1990 (TPD)	318	261
SCAG-76 Growth, Emissions for 2000 (TPD)[1]	329	270
Increase of SCAG 1990 Over No Growth	40 TPD 14%	38 TPD 17%
Increase of SCAG 2000 Over No Growth[1]	51 TPD 18%	47 TPD 21%

[1] This projection assumes that emission rates per capita are the same in 2000 as in 1990.

4. OTHER SECONDARY IMPACTS

a. Economics. Construction and operation of the wastewater treatment facilities will result in additional expenditures and a somewhat stimulated economic activity within the region. The overall economic effects of construction expenditures and subsequent additions to the annual outlays for operation and maintenance can be estimated through the use of multipliers. The effects estimated include the total increase in the output of goods and services caused by the expenditures, the total increase in earnings, and the overall increase in employment.

Table GS-36 itemizes the discounted secondary economic impacts resulting from construction of the viable alternatives. Table GS-37 presents the

Table GS-36. Summary of secondary economic impacts of construction for selected alternatives.

	NO PROJECT	B4C	C3	E2
Construction Cost	$121,959,000	$ 276,566,000	347,057,000	$ 343,155,000
Increased Output	600,160,000	1,360,980,000	1,707,867,000	1,688,664,000
Increased Earnings	223,260,000	506,284,000	635,326,000	628,172,000
Increased Indirect Earnings	162,280,000	367,998,000	461,796,000	456,591,000
Increased Indirect Labor (MY)	13,513,000	30,645,000	38,454,000	38,023,000
Increased Total Labor (MY)	15,645,000	35,479,000	44,522,000	44,021,000

Table GS-37. Summary of secondary economic impacts of operations and maintenance for selected alternatives.

	NO PROJECT	B4C	C3	E2
Operations and Maintenance Cost	$235,390,000	$ 452,561,000	$ 402,734,000	$ 511,061,000
Increased Output	661,681,000	1,272,148,000	1,132,086,000	1,436,592,000
Increased Earnings	203,798,000	391,821,000	348,682,000	442,470,000
Increased Indirect Earnings	107,208,000	252,118,000	230,392,000	287,917,000
Increased Indirect Labor (MY)	8,934,000	21,054,000	19,185,000	24,035,000
Increased Total Labor (MY)	15,368,000	30,368,000	27,071,000	34,339,000

discounted secondary economic effects of facilities operation through the facilities planning period (year 2000). The costs of construction and operation of E2, the maximum reclamation alternative, are higher than the other alternatives. Appendix VI-B considers the secondary benefits of reclaimed water to determine whether or not the additional costs are offset by benefits obtained from wastewater conservation and reuse.

Total labor manyears generated by construction expenditures vary from about 15,000 for No Project to 44,000 for the C3 and E2 alternatives. These would apply largely to the first five or six years after commitment. Total wage and salary employment in Los Angeles County was slightly over 3,000,000 job holders from 1973 through 1976. The project effects might peak at 15,000 in the early years which would be 0.5 percent, at most, of the employed force.

In the case of unemployment, however, the impact could have higher visibility. In recent years, the unemployed in Los Angeles County have numbered in the area of 300,000. A peak year of 15,000 new job opportunities would represent a full 5 percent of the unemployed and, should the labor effects engendered by the projects be drawn largely from the locally unemployed roster, a beneficial impact of significant dimensions would result.

b. Geology and Hydrology.

(1) FLOODING AND EROSION. Potential heavy flooding areas within the City are of relatively limited extent, with the largest such area in the northern part of the Verdugo Hills, and a slightly smaller area southeast of the Baldwin Hills and northeast of Inglewood. Very small areas also exist below the southwestern portion of the Santa Monica Mountains. All of these areas are within the Hyperion Service Area, but are not in locations to which populations are likely to be attracted by implementation of any Facilities Plan alternatives.

A very small area of potential inundation exists in the vicinity of the Bixby Slough, within the northwest part of the Terminal Island Service Area. Conditions in this area will not be influenced by any alternative in the Facilities Plan.

(2) SEISMIC ACTIVITY. The population at risk under the project alternatives would either remain the same or undergo a modest increase and the probability of a serious earthquake would probably remain unchanged unless the location of concentrated population were to be particularly active seismically. The major potential for change in seismic hazards to population is in the area of susceptibility to damage of the structures occupied by the population in a higher density Regional Core. The current mix of structures is heavily weighted in favor of single family wood frame structures and older commercial, industrial, and high density residential structures. Single

family wood frame structures, particularly those built before 1933, when building codes first began to seriously enforce seismic designs, are the most dangerous structures to occupy during a serious earthquake.

Because this scenario envisions a major construction effort, the dollar value of the resources (new structures) at risk in Los Angeles would be increased; however, this potential increase in resource hazards would likely be offset by reduced susceptibility to damage of these new structures.

The relative differences among the facilities plan alternatives do not substantially alter the risk to population from seismic hazards.

c. Biological Secondary Impacts. Local changes of population size and land use usually have local influences on the biology of the land involved. Natural biological areas are not expected to be substantially altered as a result of any Facilities Plan alternative since biological changes resulting from altered land use are not likely to be of very great magnitude.

G. mitigation

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G. MITIGATION

Many of the adverse impacts summarized in this report can be reduced, minimized, or eliminated by a variety of activities. EPA and the State Water Resources Control Board are constrained by the requirements of the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA), respectively, from funding these projects unless the adverse impacts of the projects are mitigated.

The City of Los Angeles is in the unique position of controlling its own utilities, air and surface transportation, and land use. The City has the ability to adopt specific city regulations and implement measures to minimize negative impacts.

This section describes a variety of measures which can be undertaken to minimize primary and secondary impacts of the proposed project alternatives.

1. MITIGATION MEASURES FOR PRIMARY IMPACTS

a. General Construction Impacts Mitigation. Some degree of mitigation is inherent in the contracting procedure, since the contractor is required by the City to adhere to the provisions of the "Standard Specifications for Public Works Construction" (APWA and AGC, 1976). Among the mitigating provisions in the specifications are:

- Dust nuisances must be abated by cleaning, sweeping, and sprinkling with water, or other means, as necessary.
- The contractor "shall not discharge smoke, dust, or any other such contaminants into the atmosphere in such a quantity as will violate the regulations of any legally constituted authority."
- Traffic associated with the project must cause no unnecessary inconvenience. Safe and adequate pedestrian and vehicular access must be provided and maintained to fire hydrants, commercial and industrial establishments, churches, schools, parking lots, service stations, motels, fire and police stations, hospitals, and the like. One-half of any affected roadway must remain unobstructed, if feasible.

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The Standard Specifications for Public Works Construction require the contractor to mitigate some, but not all, of the identified impacts. For example, there are no specific requirements with respect to construction noise, as influenced by such factors as construction activities, traffic, and hours of work. Although the contractor is required by Section 7-13 of the Standard Specifications to comply with all applicable laws, ordinances, and regulations, these restrictions may not cover specific impacts, or the contractor may not be aware of the specific law, ordinance, or regulation involved. It is thus the responsibility of the City to ensure that pertinent requirements are incorporated into the Contract documents, either specifically or by reference. The practices adopted by the contractor for conformance are generally his prerogative, so long as they achieve the specified results.

To mitigate construction noise, two major countermeasures are possible: the use of portable noise barriers and reduction in noise produced by the source devices themselves (Wyle Laboratories, 1975).

Pile driving will be required at the Hyperion site, and it is EPA policy (EPA, 1975) that whenever pile driving is performed in a sensitive residential or wildlife area, approval of plans and specifications is granted on the condition that resulting noise be limited to a maximum of 86 dB(A) at 50 feet and 80 dB(A) at 100 feet or 65 dB(A) at the nearest residential property line. Although this is a highly restrictive noise limit, it is technically achievable, and is necessary to minimize adverse effects on residents near the construction sites. To achieve this level, portable barriers may be used. Further investigation is required to determine whether the short duration of the pile driving actually warrants these mitigation measures.

General construction noise reduction measures include:

- Use of nonimpact tools where feasible.
- Maintenance of equipment to reduce noise from excessive vibration, faulty mufflers, or other sources.
- Use of baffler around stationary engines or air compressors.
- Work scheduling to minimize impacts during evening or early morning hours.

Transportation-related noise can best be mitigated by maintaining equipment in proper working order, minimizing excessive vibration, and using equipment that meets applicable federal and state motor vehicle noise standards.

b. Specific Alternative Construction Impacts Mitigation.

(1) NO PROJECT (ALTERNATIVE A1). The No Project alternative includes modernization of the Hyperion Treatment Plant (HTP) and

construction of an additional 100 mgd of secondary capacity. Sludge would continue to be discharged to the ocean. The Los Angeles-Glendale Water Reclamation Plant (LAGWRP) would form part of the overall system, but no additional facilities would be constructed. Only minor repairs and maintenance would be made to this system within its operating life.

All construction impacts would occur at HTP under this alternative. The precise schedule for the activities involved, if performed separately from the overall upgrading to full secondary treatment, is not known in detail. However, one planned element is installation of an effluent eductor in place of the present pumps for the 5-mile outfall. During the installation period, it will be necessary to discharge chlorinated wastewater through the 1-mile outfall for a period of 2 to 3 weeks. It would be preferable to schedule this operation for a period both of low rainfall (so that the capacity of the 1-mile outfall is not exceeded) and of low use of the beaches—i.e., for a time just prior to or just after the summer period when beaches are in heavy use. Frequent monitoring of nearshore water quality would also be desirable during this time.

(2) INLAND/COASTAL SPLIT OF TREATMENT CAPACITY (ALTERNATIVE B4C).

- Sewage odors will probably be controlled by some means of dispersion in which fans may be used to dissipate odors to nondetectable levels.
- Should traffic congestion become significant, traffic control personnel and equipment will be utilized to alleviate traffic problems.
- The period of beach closure will be kept to a minimum by explicitly limiting the allowable construction period in the bid specifications. The present estimated time for construction is 4 months.
- Termination of secondary treatment will cause increased concentrations of pollutants to be discharged to Santa Monica Bay. Primary effluent would be discharged instead of a combined primary and secondary effluent for approximately 3 years. This is the most significant impact, and would occur should the City proceed with the option of removing the existing secondary clarifiers. Mitigation for the impacts have not yet been developed, but must be before the Final EIS is published. Polymer addition to the primary tanks as is done at the Los Angeles County facilities to remove additional pollutants is a potential mitigation measure.

(3) COASTAL CAPACITY WITH SAN FERNANDO VALLEY HYDRAULIC RELIEF. These mitigation measures should be essentially the same as for the Inland/Coastal alternative, except for the AVORS tunnel construction,

which would require specific mitigation measures for the blasting and the disposal of the excavated materials.

(4) INLAND/COASTAL SPLIT WITH MAXIMUM POTENTIAL FOR RECLAMATION (ALTERNATIVE E2). This alternative, which includes a La Cienega facility, is similar to the previous alternatives, except for the need for mitigation for La Cienega.

Construction of the La Cienega facility may require demolition of an existing commercial activity. The actual site has yet to be finalized, but the most promising involves demolition and construction noise and dust potentially affecting a large population in both Los Angeles and Culver City. Appropriate noise and dust control requirements should consequently be placed on the contractor, in addition to the Standard Specifications.

There is a potential local economic disruption and loss of tax revenue, employment, and marketing facilities if the existing FedCo store relocates at a substantial distance from the site and/or out of the City. Every legally acceptable effort should be made to aid the displaced enterprise to find a suitable location within the immediate vicinity. Additional details are provided in the Reclamation Appendix.

c. Operational Impacts. The No Project alternative has the most serious impacts in that only partially treated wastewater and sludge would continue to be discharged to the ocean. There are also other impacts:

1. HTP is expected to release more odors than would be the case where it fully developed as planned in the other alternatives.
2. Ponding of water discharged into the Los Angeles River by LAGWRP is expected in the downstream reach below Firestone Boulevard, with possible generation of objectionable odors and insects.

The only effective mitigation of the substandard effluent quality would involve additional construction of facilities, which violates the concept of "No Project." However, some reductions in the level of toxicants, both in the effluent proper and in the sludge, could be obtained through implementation of vigorous enforcement of the existing industrial pretreatment program. A citizen involvement program could encourage composting or disposing of much of the biologically active material that currently reaches the sewage stream via garbage disposals. Reduction of this conversion of solid to liquid wastes will reduce biochemical oxygen demand (BOD) of the wastewater. A high level of citizen cooperation and interest is very difficult to implement, except under crisis conditions.

An engineering/environmental study would be required to determine the most effective method of odor control, and specifics have not been generated for this EIS. Various possibilities exist, and it is beyond the scope of this report to suggest the "best" of the possible alternatives.

Ponding of LAGWRP water may or may not present a problem in the Los Angeles River below Firestone Boulevard. This potential exists for all alternatives, so that the actual conditions encountered should be monitored during the dry season months. If unacceptable conditions are found to exist, the capacity of the low-flow section could be increased (e.g., by construction of walls along its edge), or localized modifications made to the river-bottom contour to alleviate the ponding condition. Such permanent structural modifications are considered environmentally superior to repeated application of chemical control agents.

The rest of the alternatives will have relatively minor operational impacts compared with the No Project alternative or with the existing situation. The Hyperion Treatment Plant effluent is predicted to contain some constituents that will not meet the Ocean Plan 50 percent standards, but this is not known with certainty. More stringent source controls rather than differing treatment methods are likely to be a more sound and achievable method for mitigating this condition (if it is found to exist as predicted). Two additional potential mitigation efforts are aimed at the operational effects.

d. Water Conservation and Waste Reduction. Wastewater flows, and, thus, the required capacities of collector systems and treatment plants, can be reduced by conservation measures that reduce inputs into the sanitary sewer system. Such a reduction in wastewater flows could affect wastewater facilities in at least three ways (Department of Water Resources, 1976):

- The capacity of existing gravity-flow sewage collection systems to carry solid wastes could be affected by reduced flows. Theoretically, a reduced toilet flush of 3.5 gallons only slightly affects the performance of properly designed laterals, submains, and mains. However, when the existing carrying ability is already marginal, stoppages could occur. Only a field evaluation of any additional maintenance for individual lines in a system can fully determine what impact reduced flow will have. Where existing collection systems are overloaded, the effect would be beneficial.
- The reduced flow will not substantially affect the efficiency of biological (secondary) treatment, because the primary basis for facility design is the quantity of waste loading. On the other hand, lower flows would reduce the load on other plant facilities such as sedimentation tanks. The overall effect should be to extend the capacity of sewage treatment facilities.

- Sewage plant effluent would have higher concentrations of salts and other materials (i.e., higher TDS). This would affect the concentrations of the various materials discharged. However, the total quantities discharged would be reduced. Higher TDS levels would also have some influence on reclamation potential.

Assuming that all of the new population from 1980 to 2000 will live in new dwellings, and that over this period, these dwellings will, on the average, incorporate half of the potential water-conserving features, a net saving of 5.7 mgd would be attainable. Further, assuming that 10 percent of the population would voluntarily adopt all of the listed water-saving features for existing housing would result in a reduction of wastewater flows of approximately 9.6 mgd. Although these figures are rough estimates, they indicate that significant savings in wastewater flows can be obtained through conservation measures, and the extent to which voluntary citizen cooperation can be effective in flow reductions. Still further savings could be obtained through the voluntary cooperation of commercial establishments.

A concentrated program of water conservation with appropriate moral suasion and economic coercion could reduce the need for, or postpone the investment in, alternative modular expansion units for Glendale, Sepulveda, and other potential inland facilities.

Conservation during the 1977 drought has resulted in an 18 percent reduction in flow to the Hyperion Plant.

e. Measures Designed to Improve the Understanding of Impacts of Ocean Discharges. The existing data base is inadequate for assessing the present marine impacts of HTP discharges and for predicting the changes that could occur as a result of altering the treatment as proposed in the various alternatives of the Facilities Plan. A number of studies could be conducted that would add substantially to the present data base, and would aid in assessing the impacts of HTP discharges on the marine environment. The most pertinent and feasible studies are as follows:

- Analysis of existing HTP data.
- Benthic monitoring.
- Effluent plumes.
- Metal and synthetic organic concentrations in fish.

2. MITIGATION MEASURES FOR SECONDARY IMPACTS

Secondary (indirect) impacts associated with urban development accommodated through increases in wastewater capacity and provision of additional sewer capacity would result from alternatives B4C, C3, and E2. Impacts of greatest concern to EPA and SWRCB are the effects of growth on regional air quality, water supplies, and land use.

To award a grant, EPA must be able to determine that the award action does not cause or contribute to a violation of air quality standards. The City must take actions such that there is no air quality degradation as a result of the project.

The EIS lists a variety of potential mitigation measures to reduce secondary impacts. None of these measures is specifically required by EPA; the City must determine which measures are appropriate for its particular area. Development of detailed mitigation measures during the remaining planning and analysis efforts is the responsibility of the City.

The State of California (Air Resources Board and State Water Resources Control Board) also requires mitigation of secondary impacts on air quality resulting from projects funded by Clean Water grants. If air quality analyses indicate that emissions related to grant-funded projects either contribute to the continued violation of, or prevent the maintenance of, ambient air quality standards in the project area, one of the following alternatives must be undertaken:

Alternative I

1. Resolutions acknowledging adverse air quality impacts and agreeing to participate in the development of an Air Quality Maintenance Plan (AQMP) must be provided by the grantee and the local general purpose governmental legislative body.
2. A grant condition must be agreed to that limits flows to the 10-year E-O population projection related flow for a period of 10 years after the date of concept approval, unless, prior to that time:
    a. impacts of excess flows are mitigated, or
    b. an AQMP is approved by the State.

If the project is designed and built for less than the projected 10-year E-O population related flow or the existing flow, whichever is greater, the above grant condition would not be required.

It is anticipated that in a few circumstances, this alternative may not be stringent enough to assure minimal impacts on air quality. In these cases, stricter limitations may be necessary. The SWRCB has not yet indicated if stricter limitations will be required for this project.

Alternative II

The applicant must make commitments to implement mitigation measures developed to minimize adverse secondary air quality impacts of the project. Where possible, the implementation of these measures shall be in cooperation with the local AQMP effort.

The following types of secondary impact mitigation measures should be considered. These are mitigation measures for both air quality and general growth impacts.

1. Emission control measures (stationary and mobile)
    a. Surface coatings and organic solvent usage limitations
    b. Vapor recovery and reduction in volatility
    c. Motor vehicle inspection and maintenance program
    d. Support extended warranty on new cars
    e. Support additional emission controls on motor vehicles
    f. Home utility engine replacement
2. Transportation-related measures
    a. Support regional transit improvements by appropriate agencies
        (1) Extend/expand truckline systems
        (2) Increase capacity and frequency of service
        (3) Provide exclusive rights-of-way
        (4) Improve terminal, station bus stop function
        (5) Improve vehicle safety
        (6) Improve security at transit facilities
        (7) Improve auto parking at outlying truckline stations (e.g., free parking for carpools)
    b. Local transit system improvements
        (1) Establish local transit service districts
        (2) Incorporate local goods delivery services into local transit services
        (3) Subscription and charter services
    c. Local bike path development
    d. Pedestrian paths
    e. Support transit operating improvements by appropriate agencies
        (1) Speed and frequency
        (2) Extend hours of service
        (3) Transit preferential traffic controls

        - (4) Coordinate schedule fares and transfers among systems
        - (5) More and improved information on services
        - (6) Transit pricing structures
    - f. Auto use management
        - (1) Limited road capacities
        - (2) Pricing disincentives
        - (3) Parking management
        - (4) Carpooling programs
        - (5) Staggered work hours
        - (6) Traffic flow improvement
        - (7) High occupancy vehicle programs
        - (8) Signalization priority for transit

3. Land use policies
    - a. General plan land use policies
    - b. Preservation of agricultural lands
    - c. Conservation of open space
    - d. Prevention of further shoreline development
    - e. Planning criteria for siting of public facilities
    - f. Protection of scenic areas
    - g. Protection of scientific and education resources (i.e., Tujunga Wash)
    - h. Protection of natural wildlife and vegetation to the limited extent that they remain
4. Growth management activities
    - a. No growth policies (this generally represents a failure of the mitigation process)
    - b. Growth management including slowed growth or timed development
        - (1) Overall City policy changes— Centers Concept
        - (2) Redevelopment in older communities
        - (3) Controlling and channeling growth (for example, toward central Los Angeles)
    - c. Methods of managing growth and land use

(1) Zoning
    (a) Traditional zoning— with enforcement
    (b) Innovative zoning— zoning encouraging local employment; shopping and cultural facilities that do not rely solely on the use of automobiles

(2) Subdivision regulation

(3) Open space acquisition

(4) Land banking

(5) Annexation

(6) Preferential assessment

(7) Review of development proposals (assessing environmental impacts)

(8) Cost-benefit studies of alternative land use plans

(9) Increased land use intensity near major transit corridors

(10) Phased location of development with respect to transit access

(11) Plan and require auto-free zones

(12) Plan and require rights-of-way for short-range low-powered vehicles

(13) Plan and require minimum levels of land use intensity to be developed in major activity

5. Water quality protection— improvement to the following:
    a. Urban stormwater runoff controls
    b. Erosion controls
    c. Grading regulations

Specific mitigation measures were investigated for their effectiveness in relation to the Hyperion Service area. The Hyperion Service Area growth as estimated in SCAG-76 and planned in the Facilities Plan will have a detectable impact upon 1990 air quality. The introduction of technological modifications and regulations will substantially improve air quality from the 1974 levels. Over the period the results of mobile source emission controls will become apparent and stationary sources will take on increasing importance and require controls to reduce emissions and improve air quality.

The Hyperion service district will contribute 40 tpd of RHC and 38 tpd of NO_x. These are the amounts that must be mitigated for this project. The 1974 emission level is 6.76 times the NAAQS of 8 pphm of RHC. The 1990 no-growth scenario would have RHC emissions 3.45 times the NAAQS.

Should mitigative measures be applied to emissions of RHC over the no-growth level, which represents the maximum that could possibly be attributed to implementation of the Los Angeles City Wastewater Facilities Plan, the adoption of two measures, the mandatory use of water base and high solids paints, and the restriction of organic solvents and surface cleaning, would result in a reduction of projected emissions associated with the accommodated growth. These two measures could reduce RHC emissions by an estimated 44 tpd, a 110 percent reduction in the 40 tpd emissions that could be attributed to growth.

Implementation of stringent controls on petroleum refining and marketing would result in an additional 2 to 7 tons per day of RHC emissions reductions. The relationship of RHC to NO_x would result in approximately the same effects on NO_x.

Extensive air quality analysis demonstrates that little if any air quality improvement would be discernible should controls be applied only to the San Fernando Valley (as through alternative CX). Identifiable air quality improvement could be achieved through concentration on localized transit within the regional core. The relative degree of improvement in this geographical location would be emphasized by the concentration of residents within the area. The greatest good for the greatest number could be achieved through the application of controls and transit funds within the Los Angeles City regional core. These benefits could only be achieved if concurrent efforts were made to prevent extensive sprawl development with central city degradation prior to establishment of the improved urban core environment.

This study, designed to produce mitigation measures for potential secondary impacts, has identified the following key elements for decision-makers:

- Stationary source emissions controls could mitigate emissions associated with growth that could be possibly accommodated by Facilities Plan implementation over the planning period.
- Investments in new automobiles meeting California Air Quality Standards and in technological innovations designed to reduce emissions have been and are expected to continue to improve basinwide air quality during the planning period.
- Urban core transit combined with growth management and stationary source controls could substantially benefit the residents of the City urban core through improved air quality. Benefits to nonurban core residents would be negligible and overall investment costs would be high.

The City must describe its program to implement secondary impact mitigation measures outlined in this Draft EIS. Because the combined effects of individual mitigation measures may differ substantially from their individual effects, it is important that any mitigations implementation program reflect careful coordination of program subelements.

The program description should include the following information:

- There should be an action timetable which lists specific schedules of implementation for all described mitigation measures. For activities currently underway, there should be documentation that appropriate progress is being made according to existing schedules.
- A description of the sources and availability of funding to carry out the implementation plans is needed, including any possible constraints. This should include discussions of funding for specific elements of the program, including, where applicable, comparisons of past and future levels of funding for each jurisdiction, and breakdowns of funding into local, state, and federal monies.
- There should be clear statements and assurances that programs are in effect, and are being implemented.

In addition, it is recommended that a program to evaluate the feasibility or effectiveness of additional mitigation measures be undertaken by the City.

Finally, there should be a discussion detailing the manner in which the actions of the contract cities are to be coordinated with the City of Los Angeles.

The City should also, in the form of resolutions:

- Acknowledge the problem of air quality as related to growth and sewer capacity.
- Commit each jurisdiction to cooperate in the regional planning and implementation of an air quality management plan to be adopted by the South Coast Air Quality Management District by January 31, 1979.
- Commit the City to assist in the development of a more comprehensive regional approach to solving certain environmental problems, such as increases in water use, energy consumption, solid waste generation, and parking and traffic congestion.

More detailed analysis of mitigation strategies and effectiveness is given in the main text. The City will develop a mitigation package and schedule for implementation for inclusion in the Final EIS.

H. conclusion

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H. CONCLUSION

The City of Los Angeles and EPA have provided this study to serve as a basis for public participation in decisions on constructing important wastewater treatment facilities. Providing wastewater service to a large and growing urban area is a complex, difficult, and expensive undertaking. Individual suggestions, comments, criticisms, and recommendations are welcome, and will be seriously considered when the final decisions are made.

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I. glossary

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I. GLOSSARY

Activated-Sludge Process—Use of biologically active sewage sludge to hasten the breakdown of organic matter in raw sewage during secondary treatment (EPA).

Advanced Treatment of Wastewater—Various processes used in addition to secondary treatment, including coagulation-sedimentation or electrodialysis, and adsorption (EPA).

Air Critical—The air quality is judged by the State Air Quality Resources Board to be below standards.

Air Quality Monitoring Station—Stations set up at scattered and strategic locations in an area, which continually sample for and measure pollutants which may be present in the atmosphere.

Air Pollution—Man-made and natural wastes poison (pollute) the air. Man-made wastes include: transportation wastes (motor vehicles, planes, etc.), factory waste (industry), electric power plant waste, furnace waste from fuels and the burning of garbage and other wastes. Natural pollutants (impurities) include: dust, pollen, bacteria, and soil particles.

Air Quality Standard—As the federal government uses the term, the prescribed level of a pollutant in the outside air that cannot legally be exceeded during a specified time in a specified geographical area.

Alternative—The different means by which objectives or goals can be attained. They need not be obvious substitutes for one another or perform the same specific function.

Aquifer—A bed or porous rock or sand that carries or holds water (EPA).

Benefit-Cost Analysis—Economic analysis of a project or program which yields a ratio between anticipated benefits and costs, thus revealing the relative economic efficiency of the project.

Benthos—Refers to bottom dwelling forms of marine life which crawl on, burrow in, or grow attached to the bottom of a body of water. The term benthos is also applied to the floor or deepest part of a sea or ocean. Benthos is one of three main divisions of aquatic life, the others being plankton and nekton.

Biochemical Oxygen Demand (BOD)—A measure of the amount of oxygen consumed in biological processes that break down organic matter in water; a measure of the organic pollutant load (EPA).

California Environmental Quality Act of 1970 (CEQA)—CEQA is contained in Sections 21000 to 21150 of the Public Resources Code. It has been amended by AB 301 of the 1972 Session. CEQA requires all state agencies, boards and commissions to include, in any report on any project having significant effect on the environment, an environmental impact statement. CEQA requires, in addition to the five items set forth in Section 102 of NEPA, that the statement include a discussion of mitigation measures proposed to minimize that impact.

California Water Plan—Division 6 of the Water Code, set forth in 1959, describes the California Water Plan as a "plan for the orderly development and coordinated control, protection, conservation, development and utilization of the water resources of the state.

Chlorination—The application of chlorine to water for purposes of disinfection (ineffective against many viruses) (EPA).

City Planning (Urban Planning)—The process of guiding growth and change in urban areas. "City Planning" aims at fulfilling certain social and economic objectives which go beyond the physical form and arrangement of the parts of the physical urban environment.

Demographic Studies—Involves analysis of population and social groups and the population growth of the Community Plan area involved. For residential projects, a general description of the social groups residing in the general area (usually the census tract involved and those immediately surrounding) by income level and ethnic composition is included.

Discharge of Pollutants (into Waters)—Any addition of any pollutant to navigable waters from any point source: any addition of any pollutant to the waters of the contiguous zone or the ocean from any point source other than a vessel or other floating craft (EPA).

DO—Dissolved oxygen; the oxygen freely available in water and necessary for aquatic life and the oxidation of organic materials (EPA).

Environmental Impact Statement (Final EIS)—The final version of the statement of environmental effects required for major federal actions under Section 102 of NEPA. It is a revision of the draft environmental impact statement to include public and agency responses to the draft.

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Environmental Protection Agency (EPA)—The EPA was established in 1970 by the executive branch of the federal government as an independent agency. It was created to "permit coordination and effective governmental action and to assure the protection of the environment by abating or controlling pollution on a systematic basis" (EPA).

Food Web—A series of spatially associated species, each of which lives (at least in part), as a predator, parasite, or absorber of the next lower down in the series—thus there is the transfer of food energy from the initial source in plants through a series of organisms by repeated eating and being eaten.

General Plan (Master Plan, Comprehensive Development Plan, City Plan)—City planning usage. An official document prepared in Los Angeles by the City Council and adopted by the local government setting forth its general policies regarding the long-term physical development of the City. It is a plan for the development of that area including broad policies, goals, and interrelated plans for private and public land use, transportation systems, community facilities, and all other features that together represent the decisions of local people.

Heavy Metals—Metals having a specific gravity (i.e., weight in comparison to weight of an equal volume of water) of 5.0 or over, and generally toxic in relatively low concentrations to plant and animal life. Such metals can persist in animal tissue and are capable of increasing concentration as they pass upward through the food chain. Major sources of heavy metal contamination are pesticides, limestone and phosphate fertilizers, manures and sewage sludges, and mine wastes. Other sources include products resulting from the incomplete combustion of petroleum products. Examples of heavy metals include lead, mercury, cadmium, and arsenic.

Los Angeles River—The main watercourse within the City of Los Angeles. Its headwaters are at the extreme western end of the San Fernando Valley, and it flows through the City confined within a concrete lined channel, and out to the harbor.

Margalef Index—A measure of species richness defined as: $d = (S - 1) / \log N$, where S = number of species, and N = number of individuals.

Navigable Waters—The waters of the United States, including the territorial seas, and intrastate waters (EPA).

Nektonic (Free Swimming)—Used to describe those animals of the pelagic division of the ocean which are active swimmers, such as most of the adult squids, fishes, and marine mammals.

New Source—Any point source which is constructed after the issuance of National Standards of Performance regulations (May 1974) (EPA).

Non-Point Source—Any non-confined area from which pollutants are discharged into a body of water, i.e., agricultural run-off, urban run-off, and sedimentation from construction sites (EPA).

Nutrient—A chemical substance (e.g., nitrogen or phosphorus) absorbed by green plants and used for growth (EPA).

Ocean—Any portion of the high seas beyond the contiguous zone (EPA).

Ocean Plan—The Water Quality Control Plan for Ocean Waters of California, adopted by the State Water Resources Control Board on July 6, 1972, is designed to protect the quality of the ocean waters for use and enjoyment by the people through the control of waste discharges to the ocean. The plan sets forth water quality objectives for ocean waters.

Outfall—The point of discharge for a river, drain, culvert, or sewer.

Outfalls of Hyperion (the Major Sewerage Treatment Plant for LA City)—(1) One-mile outfall—an outfall used now only for emergency use.
(2) Five-mile outfall—the City's main effluent and disposal conduits. A submarine line which discharges effluent into the ocean at a depth of 188 feet through two 4,000-foot diffuser legs which are at the end of the outfall. (Since 1961 only treated effluent has been discharged.)
(3) Seven-mile outfall—the City's sludge outfall. Discharges secondarily treated waste (sludge) at the head of a submarine canyon seven miles at sea, at a water depth of three hundred twenty feet. Termination of ocean sludge disposal by 1977 will necessitate the reservation of this outfall for emergency use only.

Permit—A legally-binding document issued by a state or federal permit agency to the owner or manager of a point source discharge. The permit document contains a schedule of compliance requiring the permit holder to achieve a specified standard or limitation (by constructing treatment facilities or modifying plant processes) by a specified date. Permit documents also specify monitoring and reporting requirements to be conducted by the applicant. All permits issued are valid for a maximum of five years (EPA).

Phytoplankton—The plant forms of plankton. They are the basic synthesizers of organic matter (by photosynthesis) in the pelagic division.

Point Source—Any discernible, confined and discrete conveyance including . . . any pipe, ditch channel, tunnel, conduit, well, discrete operations, or vessel, or other floating craft from which pollutants are or may be discharged (EPA).

Pollution—The man-made or man-induced alteration of the chemical, physical, biological, and radiological integrity of water making it less desirable for the propagation of balanced indigenous population of fish, for recreation, industry, or wildlife uses (EPA).

Pollutant—Waste discharged into water including: dredged soil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat wrecked or discarded equipment, rock, sand, cellar dirt, and industrial, municipal and agricultural waste; but not including sewage discharged from vessels nor material injected into wells in connection with the production of oil and gas (EPA).

Porter-Cologne Water Quality Control Act—Provides that: the waters of the state shall be protected for use and enjoyment by the people of the state; the State Board and nine regional boards are established as the principal state agencies with primary responsibility for control of water quality. The State Board is responsible for the formulation and adoption of state policy for water quality control.

Pretreatment—Any process used to reduce the pollutant load before the waste is introduced into a sewer system or delivered to a treatment plant.

Primary Treatment—The first stage in wastewater treatment in which floating or settleable solids are mechanically removed by screening and sedimentation.

Public Law (P.L.) 92-500 (Federal Water Pollution Control Act), "The Act"—U.S. Public Law 92-500; a principal water quality legislation that sets uniform nationwide minimum standards for wastewater treatment and discharge. Amendments of 1972 provide for three levels of planning: (1) 201—Facilities Planning, (2) 208—Areawide Wastewater Management Planning, (3) 303(3)—Basin Planning.

Receiving Waters—Bodies of water into which wastewater effluents are discharged (EPA).

Sanitary Landfill—A site where solid waste materials are disposed of on land in a manner which prevents their escape into—or pollution of—the surrounding environment. The waste is spread in layers, then compacted to the smallest practical volume and covered with compacted soil at the end of each working day.

SCAG-76 Growth Policy Forecast—The current population projection used by the Southern California Association of Governments (SCAG) as a guide to regional growth and land-use policy.

Schedule of Compliance—Description of remedial action to be accomplished by the permit holder (type of facility to be installed or alternative control measures to be established and a sequence of actions leading to compliance with applicable standards (EPA).

Secondary Treatment—The second step in most waste treatment systems in which bacteria consume the organic parts of the wastes. It is accomplished by bringing the sewage and bacteria together in trickling filters or in the activated sludge process (EPA).

Series E-0—One of several population projections issued by Department of Finance (DOF). Series E-0 is based on a low birth rate and zero net migration into California; a mandatory guideline for Clean Water Grant Program project evaluation in critical air basins.

Sewer—Any pipe or conduit used to carry sewage or storm water to treatment plants or receiving waters (EPA).

Sewer, Combined—Sewer that carries both waste and storm water (EPA).

Sewer, Interceptor—A sewer which collects the sewage from the main and trunk sewers and carries them to points of treatment or discharge (EPA).

Sewer, Lateral—A street sewer that serves a limited number of properties and discharges into a trunk sewer (EPA).

Sewer, Sanitary—In a system of separated sewers, the pipes that carry wastewater but exclude storm water (EPA).

Sewer, Trunk—A sewer that transports wastewater from collecting (lateral) sewers to the treatment plants (EPA).

Sludge—The solids removed from wastewater by sedimentation and precipitation; often presents a problem of ultimate disposal (EPA).

Southern California Bight—The concavity in the Southern California Coastline which forms the Los Angeles bay area.

Territorial Seas—The portion of the sea that is within the three mile limit (EPA).

Trophic Level—In biotic communities organisms whose food is obtained from plants by the same number of feeding steps in a food chain are said to belong to the same "trophic level"; thus green plants occupy the first trophic level, the plant-eaters (i.e., herbivores), the second level, the carnivores (i.e., meat-eaters) which eat the herbivores, the third level, and secondary carnivores (i.e., carnivores which eat other carnivores), the fourth level.

Water-Quality Standard—Quality standards are set by the local State Regional Water Quality Control Board and are plans for water quality management specifying: the use (recreation, fish and wildlife propagation, drinking water, industrial or agricultural) to be made of the water; criteria to measure and protect these uses; implementation and enforcement plans; and an anti-degradation statement to protect existing water quality (EPA).

Water Quality Criteria—The levels of pollutants that affect the suitability of water for a given use (EPA).

Zooplankton—The animal forms of plankton. They are the principal consumers of the phytoplankton and, in turn, are the principal food for a large number of squid, fishes, and baleen whales.

ACRONYMS

AC—Alternating Current

ADA—Average Daily Attendance (schools)

APCD—Air Pollution Control District

AQMA—Air Quality Maintenance Area, State of California and EPA designated

AQMP—Air Quality Maintenance Plans, designated to achieve state and national ambient air quality standards in an AQMA

ARB—Air Resources Board

ASBS—Areas of Special Biological Significance

AVORS—Additional Valley Outfall Relief Sewer

AZ—Analysis Zone

BPWTT—Best Practicable Waste Treatment Technology, to be achieved by 1983 under P.L. 92-500

BOD-BOD$_5$—5-day Biochemical Oxygen Demand, an index estimating organic material in a water sample

CAC—Citizens Advisory Committee

CALTRANS—California Department of Transportation

CBD—Central Business District

CEQ—U.S. Council of Environmental Quality

CEQA—California Environmental Quality Act of 1970

CIS—Coastal Interceptor Sewer

COD—Chemical Oxygen Demand, an index estimating a water sample's total organic content

COE—U.S. Army Corps of Engineers

COS—Central Outfall Sewer

CPEL—Community Population Exposure Level

CSD, CSDLA—County Sanitation Districts for Los Angeles County

CVT—Continuous Variable Transmission

CZCC—Coastal Zone Conservation Commission

DC—Direct Current

DDE—A degradation product of DDT

DOF—California Department of Finance, the source of population projections

DO—Dissolved Oxygen. The oxygen dissolved and freely available in water

DOH—California Department of Health

DWP—City of Los Angeles Department of Water and Power

DWR—California State Department of Water Resources

EGR—Exhaust Gas Recirculation

EIR—Environmental Impact Report, environmental evaluation required under CEQA for project proposals with potentially significant environmental effects

EIS—Environmental Impact Statement, environmental evaluation required under NEPA

EIR/EIS—Environmental Impact Report/Statement. This document fulfills the requirements of both state and federal governments, and will serve for both state and federal environmental impact review procedures.

EPA—U.S. Environmental Protection Agency

EQR—Environmental Quality Rate

FDA—Food and Drug Administration

FDC-U—Federal Urban Driving Cycles

FHA—Federal Housing Authority

FHWA—Federal Highway Administration

FWPCA—Federal Water Pollution Control Act: P.L. 92-500

HDV—Heavy Duty Vehicle

HTP—Hyperion Treatment Plant

HSA—Hospital Service Area

HUD—U.S. Department of Housing and Urban Development

ICEL—Individual Cumulative Exposure Level

I/I—Infiltration/Inflow

ITE—Institute of Traffic Engineers

JOS—Joint Outfall (sewer) System, serves majority of Los Angeles County Sanitation Districts

JPL—Jet Propulsion Laboratory

JTU—Jackson Turbidity Units

JWPCP—Joint Water Pollution Control Plant, treatment plant of the JOS

L.A. AQCR—Los Angeles Air Quality Control Region

L.A. CAB—Los Angeles Community Analysis Bureau

LACFCD, FCD—Los Angeles County Flood Control District

LACSD—Los Angeles County Sanitation District

LADWP—Los Angeles Department of Water and Power

LAFCO—Local Agency Formation Commission

LA-GWRP—Los Angeles-Glendale Water Reclamation Plant

LARTS—Los Angeles Rapid Transit System

LAUSD—Los Angeles Unified School District

LAX—Los Angeles International Airport

LAZTP—Los Angeles Zoo Treatment Plant (in Griffith Park)

LCSFVRS—La Cienega and San Fernando Valley Relief Sewer

LDMV—Light Duty Motor Vehicle

LNG—Liquified Natural Gas

LRV—Light Rail Vehicle

MBAS—A synthetic detergent

MPN—Most Probable Number

MWD—Metropolitan Water District of Southern California

NAAQS—National Ambient Air Quality Standards, promulgated pursuant to the Clean Air Act of 1970

NCOS—North Central Outfall Sewer

NEPA—National Environmental Policy Act of 1969; see EIS also

NMHC—Non Methane Hydrocarbon

NOS—North Outfall Sewer

NOS-LCSFVRS—North Outfall Sewer-La Cienega and San Fernando Valley Relief Sewer System

NOS-NCOS—North Outfall Sewer-North Central Outfall Sewer System

NPDES—National Pollutant Discharge Elimination System; Title IV provisions of P.L. 92-500 which license wastewater discharges to navigable waters

O & M—Operation and Maintenance costs to a facility

OMB—Federal Office of Management and Budget

OPR—California State Office of Planning and Research

PCB—Polychlorinated Biphenyls—a class of chlorinated hydrocarbons

P.L. 92-500—U.S. Public Law 92-500; a principal water quality legislation that sets uniform nationwide minimum standards for wastewater treatment and discharge. Amendments of 1972 provide for three levels of planning: (1) 201—Facilities Planning, (2) 208—Areawide Wastewater Management Planning, (3) 303(3)—Basin Planning.

PST—Pacific Standard Time

PUD—Planned Unit Development

QOL—Quality of Life

RHCD-RHC—Reactive Hydrocarbons

RPC—Los Angeles County Regional Planning Commission

RPEL—Regional Population Exposure Limit

RSA—Regional Statistical Areas; provide basis for subarea breakout of population, economic, social data

RTD—Southern California Rapid Transit District; key transportation utility in Southern California

RTPA—Regional Transportation Planning Agency

RWQCB—California Regional Water Quality Control Board; sets treatment and discharge standards

SCAB—South Coast Air Basin; roughly covers counties of Ventura, Los Angeles, San Bernardino, Orange, and Riverside

SCAG—Southern California Association of Governments; organization of municipal governments in six-county area of Southern California

SCAPCD—Southern California Air Pollution Control District

SCCWRP—Southern California Coastal Water Research Project; organization performing oceanic research off Southern California

SCRTP—Southern California Rapid Transit District

SCE—Southern California Edison

SIP—State Implementation Plan for Achieving and Maintaining the NAAQS, prepared under State Air Resources Board

SJNP—San Joaquin Nuclear Plant

SNG—Substitute Natural Gas

SS—Single Shaft (a turbine engine)

SWP—State Water Project; imports waters to Southern California from Northern California

SWRCB—California State Water Resources Control Board

t—Test

TAZ—Traffic Analysis Zone

TC—Torque Converter

TCB—Trichlorobenzene

TDS—Total Dissolved Solids

TH—Total Hardness

TICH—Total Identifiable Chlorinated Hydrocarbons

TITP—Terminal Island Treatment Plant

UMTA—Urban Mass Transit Administration

USGS—U.S. Geologic Survey

USPHS—U.S. Public Health Service

UTM—Universal Transverse Mercator

VMT—Vehicle Miles Traveled; a principal variable determining motor vehicle air pollutant emissions

VORS—Valley Outfall Relief Sewer

VS—Volatile Solids

VSS—Volatile Suspended Solids

VSB—Valley Settling Basin

VSTC—Variable Stator Torque

VTDS—Volatile Total Dissolved Solids

WDR—Waste Discharge Requirements of the NPDES

WRP—Water Reclamation Plant

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